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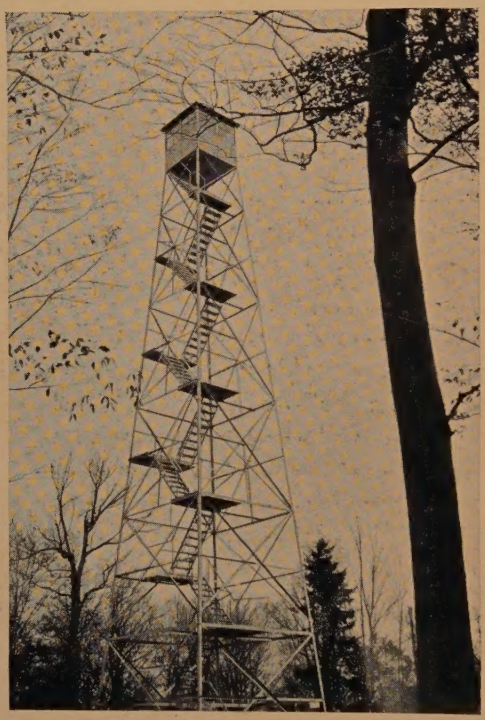

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JOURNAL of FORESTRY

VOL. XXVII MARCH, 1929 No. 3

The Society is not responsible, as a body, for the facts and opinions advanced in the papers published by it.

EDITORIAL

A PROVIDENTIAL VETO

A POCKET VETO by President Coolidge in the closing hours of the Seventieth Congress is all that saved a portion of the Ouachita National Forest in Arkansas from being converted into a "national park." The bill had been vigorously opposed both by the Forest Service, the National Park Service, and by many conservationists in all parts of the country. That action by the President was necessary to prevent it from becoming a law is ample evidence that the basic distinction between National Forests and National Parks is not yet generally recognized and approved. As a result both systems are in danger.

The first National Park, the Yellowstone, preceded the first National Forest, also the Yellowstone, by nearly twenty years. Since then the National Parks have increased to nineteen with a total area of seven million acres, the National Forests to one hundred sixty with an area of one hundred fifty-nine million acres. The smaller number of National Parks is indicative of the extreme care that has been exercised in their selection. With no definitely formulated policy to serve as a guide, Congress has, nevertheless, until within the last few years, been remarkably consistent in setting its stamp of approval only on outstanding examples of beauty and grandeur.

This high standard has created a system of National Parks which, with a few minor exceptions, is really unique. Unfortunately their very superiority has given them a reputation and a popularity of which selfish local interests are now trying to take advantage by having the name applied to areas of inferior quality. Call any area a "national park" and the people will automatically flock to it, is the theory.

So Congress has been flooded with bills engendered by local boosters and fostered by clever politicians, all aimed at capitalizing the national park trade mark. The Ouachita Bill is distinctive only because it was so aggressively pushed, because it so nearly became a law, and because it affected a National Forest.

This movement, which has already gained dangerous headway, must be checked. Ostensibly aimed at making fine examples of nature's handiwork more available for public use, it in reality would result only in cheapening the National Parks and in reducing the value of the National Forests. National Parks are not primarily playgrounds or recreation resorts. They are rather art

galleries and museums of the best that nature has to offer. Once this standard is lowered a group now absolutely unique in grandeur and in biological, geological, and historical interest will degenerate into a miscellaneous collection of mediocrities.

On the other hand National Forests, although intended primarily for the production of timber and the protection of streamflow, are by no means closed to recreation. Already visited by some millions of persons each year, their use as recreational centers is bound to grow. To propose turning them into National Parks in order to make them available for this purpose is nonsense. Indeed it is worse, since such action would mark the beginning of a process that would not only interfere with their usefulness and their effective administration but might lead in time to their actual dismemberment. Once start the practice of alienating National Forest lands for purposes for which they are not suited or which they are already serving satisfactorily in their present status, and there will be no end to the increasingly insistent demand to release them not only for National Parks but for state parks, state forests, city parks, and what not. Definite pronouncement by Congress of the purposes for which National Parks may be created would help the situation; but beyond this there is need both for a classification of lands that will devote them to their best use and for a broadly national as opposed to a narrowly local viewpoint.

In this connection it is well to emphasize the need for marked expansion in the present area of state, county, and town parks and forests. Here, rather than in attempts to remake the National Parks and National Forests, lies the real answer to the legitimate demand for increased facilities. Nation and state working together can solve the problem without jeopardizing the integrity of the federal system of National Parks, National Forests, and National Monuments which has been more than fifty years in the making and which experience has proved to be sound.

Let no one imagine, however, that the veto of the Ouachita Bill marks the end of the present onslaught. Sectionalism, States' Rights, and local cupidity are by no means dead. Eternal vigilance alone will protect the National Parks from lowered standards and the National Forests from possible dismemberment. Foresters may well take the leadership in preventing either of these calamities.

WHY SAWLOGS?

By ALFRED GASKILL
Brandon, Vt.

HOW SHALL the quandary of foresters and their allies the lumbermen be resolved? The success of forestry advocates in bringing about a very general acceptance of their ideas, *in principle,* is rather remarkable. When it comes to detail, serious troubles develop. Radical differences and false impressions among the non-technical are to be harmonized, while the foresters themselves spend much effort dodging stubborn facts. As for the practical foresters, the lumbermen, their interest may be keen and active, but, lacking a workable program, they see no assured future for their business.

What is the argument? The United States once was the most generously forested area on earth: the nation has used wood lavishly and has been developed in large measure upon its timber resources: the consumption of forest products is greater than that of any other country: *ergo,* we must conserve our vanishing forests; we must plant trees and produce sawlogs to the end that lumber shall always be abundant. When so clear-cut and promising a situation fails to interest operators and investors, or at any rate fails to satisfy their economic judgment, a serious fault lies somewhere.

Looking at the problem without prejudice, and with some knowledge of technical forestry and of economic laws, I suggest that forestry the world over carries two tremendous handicaps. The first is that cultivated timber costs more than virgin or volunteer timber, consequently that with higher, not lower, prices the industry must meet a steadily growing competition; and the second refers to the excessive waste in the woods and in the sawmill. How can any enterprise do other than halt under such circumstances?

As to the first fact, most lumbermen recognize it, and finding no one to tell them *how much* cultivated timber will cost when it is ax-ripe, dare not venture: many foresters studiously ignore, or deny, it; other foresters occasionally, and indirectly, endorse it by urging the shortest possible rotation. As I have ventured to assert elsewhere, there is no evidence that, barring perhaps a few fence posts, box boards, and the like from favored plantations, a single foot of cultivated lumber produced in this country has ever returned its cost—all items of cost being fairly counted. One risks much who embarks upon an investment running a hundred, eighty, sixty, even forty years, and subject to hazards of fire and pests, and to tax levies that cannot be determined—not even estimated.

Upon the second point one is tempted to say that all foresters, that is, both the professionals and the lumbermen, have been so content with minor economies—low stumps, short lengths, better mills, and so on—that the primary conversion waste in tops, lops, slabs, sawdust, etc.,

totaling close to fifty per cent of the tree content, is practically ignored! Where does this fit with modern industrialism, according to which profit is apt to be measured in terms of wastes recovered?

Let us be honest: sawmills and logging methods are wasteful, necessarily so; if to that be added the inevitable high cost of cultivated timber, it appears clear that no future crop of sawed lumber can be produced at anywhere near present prices, to say nothing of those ruling a generation ago. As price goes up, use declines. Lumber is no exception to that law.

Then there is to consider substitutes brought into play for other reasons than cost; and that leads to a consideration of the *intrinsic* value of lumber. Contrary to a widely held belief, wood is *not* the *best* material for many of its uses, but has been accepted because of availability, easy working, comparatively low cost, and so on, and in spite of its bulk, its inflammability, its tendency to decay and to be deformed. And, regretfully, one must deny the reiterated assertion that "the timber requirements of the United States are far greater than those of any other country." It may be true that our consumption has greatly exceeded, and still exceeds, that of other countries, but that is quite another story.

II

In view of these facts, or what seem to be facts, it is impossible to escape the conclusion that under its inevitable handicaps, and in free competition with other materials, lumber cannot fail to be used less and less as the virgin, low-cost store is exhausted. What then are we to do? It is unthinkable that this nation, or any nation, can thrive without a generous (not an unlimited) supply of forest products, or their equivalent. My answer is that every difficulty can be resolved, and every need satisfied, by substituting for *most* lumber forms wood substance in shapes for final use, produced by disintegrating it chemically or mechanically and molding it under pressure. For most bulk products the crude wood substance —cellulose, lignin, etc.—would stand considerable "adulteration" with earths.

Think of it: we cultivate and protect a forest for fifty or a hundred years, and when the trees are felled, literally, actually, waste half their volume in the process of making lumber, and then waste some more in working up the lumber! The tragedy of our forests is not that they have disappeared, or are disappearing, but that in their going, even to make homes and cities, so large a part of every tree has been unused. Is it not time to cast aside the outworn, wasteful, time-consuming methods of forestry and lumbering, and, with the help of chemist and mechanician, to devise a real American method of lumber production?

I am aware that there is little that is new in this thought, beyond its suggested application to forestry at large. The range of articles produced from cellulose expands daily; more material will be needed. The entire product of the forests, or so much of it as is not wanted in other forms, and all farm wastes, can be converted by digestion, abrasion, explosion, or other means into substances as divergent as silk, cotton, paper, moulding, doors, cabinet wood, and coarse boards. For structural forms the choice

apparently must be between metal and high cost sawtimber.

III

The detail of my suggestion is simple. Instead of maintaining trees through a full lifetime or longer, let most of our lumber and its derivatives be produced from saplings, or even brush, grown in the few years of the tree's utmost vigor. The law upon which this proposal rests is that, whereas a timber tree as it approaches maturity commonly increases in volume at not over four per cent (compound) a year, the same tree in its younger stages grows much more rapidly. It is easily possible for a stand of saplings to show upwards of ten per cent annual increase up to fifteen or twenty years of age. Furthermore, a forest in the "thicket" stage is all live wood: competition has not yet killed the weaker individuals and everything is available. Of course a forest of this type can be of one species if that is desirable, but, since volume of usable material is the chief objective, it probably would mean for bulk production that all species and every part of every plant—branches, twigs, even leaves—would go to the mill. Naturally a reaper is to be devised; yet, with heavy tractors and army tanks as patterns that should present no serious difficulty. For the rest let the chemists and mechanicians be called upon. That they already are alive to the possibilities is evidenced by their work upon refined cellulose products, and in the way of utilizing farm waste. So far as I know the problem of crude, mass production has not been taken up.

IV

Before going further with the argument let us see what it means in the way of economy to utilize trees at, say, fifteen years of age instead of carrying them to sawlog size:

1. The saving by felling a tree while its growth rate is high is indicated above. In practice the harvest age will depend as always upon species, location, labor costs, and so on.

2. The entire product of the soil, barring stumps *perhaps,* is made marketable as against the bare fifty per cent of its total volume that a tree yields in sawed lumber. In many lumber operations the loss or waste is more than fifty per cent of the tree content.

3. Loss by fire is reduced to an insurable minimum, for fifteen years is not too long to determine actual carrying charges, and, consequently, to limit any damage suffered. The same is true of insect pests and disease. In practice an infected or infested area could be promptly cut over and salvaged. The fire hazard is a most important factor, for, despite every effort, the cost of protecting immature forest now runs close to the prohibitive point. The shorter the term of that protection the surer the investment, for fire control is recognized as an absolute condition to any undertaking in forestry.

4. The tax nightmare is eliminated, or greatly lessened, by the shortened term of growth. The owner will be less affected by burdensome assessments; the community interest can be better conserved.

5. The question of slash is disposed of—there will be none.

6. Dry kilns, storage yards, stickers, and the great capital involved in them, all become obsolete.

7. Silviculture is reduced to its lowest terms. The forester's task will be to produce the utmost volume, rather than the highest form. Beyond that there is required no cleaning, no thinning, no struggle to dispose of intermediate yields.

No effort is made to sum up the savings enumerated (there probably are others), for most of the items must be related to specific localities, and to concrete conditions. This paper aims at no more than to suggest that the problems of forestry and lumbering, which have reached something like an impasse, can be resolved only by some radical measure. Lacking a better program, it is proposed that the substance of all trees, rather than the form and composition of various kinds, be taken as the basic raw material of a new wood industry.

V

But what is the other side of the picture? Are we to have no real forests, no woodland temples, no ways of pleasantness, no mighty beams, no beautifully marked boards, no electric poles, no railroad ties, no cordwood? "Yes," to every item, and to every requirement, whether it be masts, flooring, or gun stocks. Timber can and will be grown when, where, and to the extent that it is profitable, either æsthetically or economically. The movement towards recreation forests is too admirable and too advanced to be halted; it is bound to embrace as many areas of fine standing timber, and as many plantations, as can be financed. It *may* be found expedient to maintain commercial, let us call them "faggot," forests quite distinct from timber or æsthetic forests, and to clear cut them at short intervals; but, with proper reference to their character and location, why not? My proposal means no more than that the main burden of wood supply shall be shifted from high forest and the sawmill to juvenile "faggot" forest which shall supply pulp or other disintegration mills in conjunction with compressors.

This change cannot come about suddenly, for what remains of the virgin stand, and much of the second growth coming on, will keep many sawmills going for a generation or more. It may be taken as a warning that forestry in America—always the foresters and the lumbermen in coöperation—faces the task of saving the lumber industry, not by trivial modifications of time-worn methods, but by evolving practices that harmonize, not conflict, with natural law and with modern industrialism.

And before laying aside forever the book of European forestry, upon which we have drawn far too largely, we can profitably take one leaf. That leaf tells us that the success of virtually every forestry undertaking in central Europe, at least, is dependent upon the salability of thinnings and firewood. Sawlogs alone will not pay their way! In this respect our handicap is the greater because our original excess of firewood is increasing through the protection of cut-over forests, and by the actually lessened use of wood as fuel. This last is mainfested by the trend of population from rural to urban, and by the growing use, even upon farms, of petroleum and other fuels involving less labor.

To the oft-made argument, less the forester's than the layman's, that forests are necessary for stream control, it can be said that wherever such control is possible—it is not possible everywhere, as on level, sandy pine lands—"faggot" forests actually are more effective than high forests because the soil is more completely sheltered.

It is needless to enlarge much upon the lessening use of wood: perhaps the most notable examples are found in the replacement of wood by metal in every form of vehicle—road, rail, and water—and in the prolongation of the life of railroad ties and structural timbers by preservative treatment. True, these changes touch the major product of the sawmills to only a slight degree, yet the signs of curtailment are to me very clear and have a marked trend towards pulp-mill substitutes. If the crude forms now in vogue can crowd the sawed product why should they not be followed by sash, flooring, and every shape that can be standardized?

VI

Perhaps a review of the growth of the lumber industry will be helpful. Lumber production progressed with the development of the country, its centers moving from New England to the Lake States, to the Gulf section, to the Pacific coast, where it rests, leaving a trail of smaller pick-up mills in every region. The record for earlier years is faulty, but apparently production of sawed lumber, including all building material, box boards, etc. (the accepted basis), reached its peak in 1906; thereafter it fell sharply to 1921, when a slight, irregular rise set in. The interpretation of this is that the *per capita* consumption in 1906 was 525 board feet; it was but 245 board feet in 1921, and only 325 board feet in 1925. That is, a clear reduction of forty per cent in twenty years! Through this movement the country has given no sign of timber distress, other than having to find new sources of supply, and, in some cases, having to draw upon other than the accepted wood species. The slack (loose joint) barrel industry illustrates both these points. Apart from such difficulties as these, practically the sole complaint has been of mounting cost, and that is largely, though by no means entirely, accounted for by transportation charges consequent upon longer hauls. The fact to be faced is that for many purposes wood is no longer used as a matter of course, but with careful reference to its cost and utility in comparison with other materials. This is shown by the recent marked falling off in the demand for second growth pine box boards, apparently due to the successful competition of paper-board containers. And again, in my home state, Vermont, where upwards of 1200 bridges, largely of wood, were destroyed by the flood of November, 1927, and are being replaced, in the majority of cases, by others of concrete and steel. Yet two-thirds the area of Vermont is in forest, and bridge timber is always close at hand.

Against this falling utilization of timber is to be set a considerable increase in the use of wood for pulp and paper, though the total of that has reached no more than nine per cent of the volume of the present sawmill output.

VII

That my suggestion will appear to many as too radical for serious consideration is quite within the range of probability, yet, if my main contention, that in the next generation sawlogs, as the chief source of lumber, cannot return their cost, is at all well founded, the time is fully ripe to consider the alternatives. The movement toward substitutes is well under way, chemists upon every hand are demonstrating the value of cellulose, whether derived from farm waste (straw, corn-stalks, weeds) or from wood. It is not a question of producing paper from wood of every kind, though that is not excluded, but of utilizing the whole product of the forest while it still is growing rapidly, instead of producing trees through a long period, and then so handling them that at least half their volume is lost.

If the question turn upon plantations, it can be said that there can be as much satisfaction, and more profit, in a crop of fifteen or twenty years of age than in one of sixty or eighty years. But in this connection the value or need of planting at all is to be considered. If "faggot" forests will furnish the material required by the nation's industries in the stead of sawed lumber, it is easily possible that we have now, and that too in the most favorable localities, all the land under forest that can be economically justified. In a word, over-production may be around the corner.

Another point will occur to technical readers; namely, the very general preference for softwoods rather than for hardwoods. This preference found justification in the lighter weight and easier working of the softwoods as a class, and in the more economical exploitation of the pure, or semi-pure, forests in which they commonly are found. This preference has weakened with the exhaustion of the favored species, and many hardwoods, long ignored, are now regularly marketed. Yet, in most commercial forests, the hardwood content is still a problem. That problem may not be resolved at once, though competent chemists are confident. At any rate the newly enacted McSweeney-McNary Law affords the means of testing out such problems to a conclusion. They surely are as important as any "research" concerning the production or utilization of sawlogs. To the extent that my suggestion is practical the hard-worked phrases "destructive lumbering" and "forest devastation" become meaningless.

USE OF THE SCHEMATIC DIAGRAM TO ASSESS THE CUTTING BUDGET

By D. M. MATTHEWS

Professor of Forest Management, School of Forestry and Conservation, University of Michigan

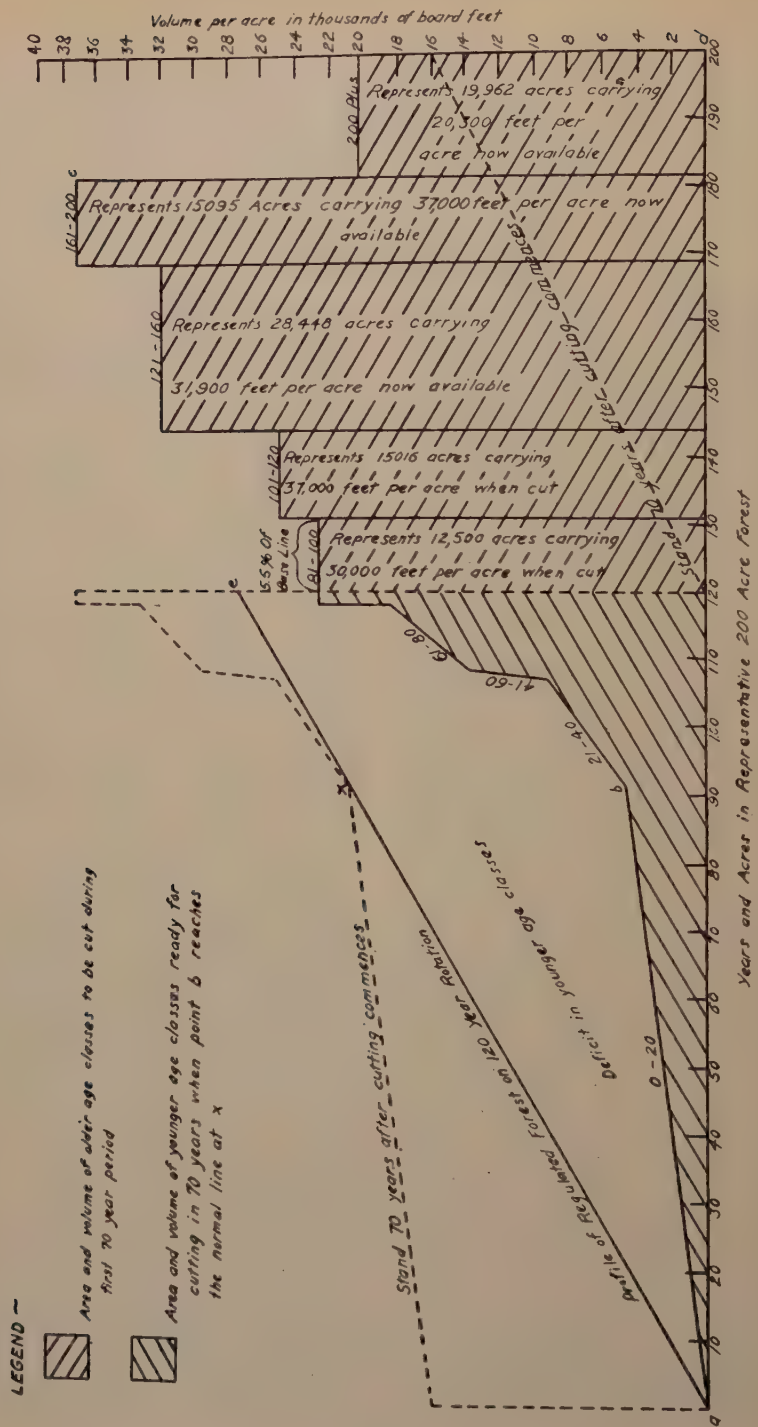
PRELIMINARY regulation of large areas of forest, where the reconnaissance data furnish definite information as to age classes, where these age classes are sufficiently distinct so that they can be definitely located and logging confined to them as requisite, and when empirical or other yield data for the various classes are available, is greatly facilitated by the use of the schematic diagram.

We are all familiar with the graphic representation of the volume of a normal forest by plotting the volumes of the different age classes on cross-section paper, where the abscissæ represent years and acres and the ordinates represent volumes. This is a most useful way of visualizing the gradation of volumes from the youngest to the oldest age classes in a regulated normal forest, and indicates at once the obvious fact that the annual cutting budget is the volume of the oldest age class. Similar graphic representation of actual distribution of age classes and their volumes in an unregulated forest will visualize the problems which must be solved in planning for regulation, and will indicate what the annual cutting budget during the preliminary stages of regulation should be.

As an illustration of the procedure let us take the following actual figures from the reconnaissance data on which the present working plan for the Cœur d'Alene National Forest is based. These data are as follows for the western white pine type:

Age class Years	Total area		Area in 200-acre sample forest	Empirical yield
	Acres	Per cent	Acres	Board feet per acre
0–20	103,867	45.6	91	....
21–40	18,079	7.9	16	....
41–60	624	0.3	1	....
61–80	11,263	4.9	10	6,600
81–100	15,422	6.8	13	22,700
101–120	15,016	6.6	13	24,900
121–140	28,448	12.5	25	30,100
141–160				33,700
161–200	15,095	6.6	13	37,000
200 plus	19,962	8.8	18	20,300
Total	227,776	100	200	

Inspection of the above data reveals much irregularity in age class distribution. It is also evident that heavy loss results from carrying timber beyond 200 years of age and that, unless because of technical or market considerations some large dimension timber is required, the forest can be satisfactorily operated on a rotation of 120 years. When diagrammatically presented these facts are unmistakable and for this reason alone—the visualization of the data—the diagram is worth while. In the accompanying diagram the figure *a, b, c, d* represents the present distribution of age classes, and the figure *a, e, f* represents the normal distribution of age classes of a


Volume per acre in thousands of board feet
40 38 36 34 32 30 28 26 24 22 20 18 16 14 12 10 8 6 4 2 0
200 Plus
Represents 19,962 acres carrying 20,300 feet per acre now available
161-200
Represents 15095 Acres carrying 37,000 feet per acre now available
121-160
Represents 28,448 acres carrying 31,900 feet per acre now available
101-120
Represents 15016 acres carrying 37,000 feet per acre when cut
81-100
Represents 12,500 acres carrying 30,000 feet per acre when cut
Stand 10 years after cutting commences
Profile of Regulated forest on 120 year Rotation
Deficit in younger age classes
0-20
21-40
41-60
61-80
Years and Acres in Representative 200 Acre Forest
LEGEND —
Area and volume of older age classes to be cut during first 20 year period
Area and volume of younger age classes ready for cutting in 20 years when point b reaches the normal line at x

regulated forest operated on a 120 year rotation, with the yield at rotation age considered to be the average of yields of the 101-120 and 121-140 year classes, or 27,500 board feet per acre. These age-class volume data are taken from the empirical yield data given in the above table and should, therefore, be possible of attainment.

In constructing the diagram a base line is laid off on a convenient scale of 200 units, each of which represents one year of age of the timber and likewise one acre of the sample representative forest. These are the abscissæ of the diagram, the ordinates being yields in thousands of board feet per acre. The actual areas of the different age classes are plotted in on the horizontal scale from the values given in the above table for acres in the sample 200-acre forest. This divides the base line into segments which are proportional to the actual acreage distribution of age classes in the forest. The yields for the various age classes are now plotted in from the ordinate scale using the empirical yield data where available and reading values from the line *a-e,* the profile line of a normal forest on a 120-year rotation, for the younger age classes for which empirical data are not available. These latter values are obviously representative of potential and not actual volume. The diagram is now representative of the actual age-class distribution in the forest and also shows volume distribution. Further, the profile *a, e, f,* shows what the age class and volume distribution should be for a forest regulated on a 120-year rotation.

In any plan of regulation the cutting budget must be made up primarily from timber now mature or shortly to be mature and this timber must be made to last until the younger age classes are ready for the axe. Also the budgets must not vary greatly from year to year and the whole cutting plan must aim at equal annual sustained yields equivalent in volume to the productive capacity of the forest. It is often difficult to fix an annual cutting budget which will permit of maximum production without the danger of a hiatus due to lack of mature timber. Any cessation of logging operations, especially if a large amount of capital is involved, is likely to be very costly. It is therefore well to plan in the first instance for the eventual harvesting of the younger age classes, and then to make the first cutting budgets fit this plan. Here the diagram is immediately helpful.

On inspection of our diagram we find that the younger age classes show the greatest departure from normality. The oldest portion of the largest of these, in this case the youngest age class of from 0-20 years, will not reach the correct position on the profile of the regulated forest until approximately 70 years from now. This figure is determined from the location of the point *b* on the diagram with reference to the nearest age ordinate of the regulated profile. It falls on the diagram very close to the ordinate corresponding to 90 years. As the age of this timber is now 20 years, 70 years must elapse before it will attain the correct age in the regulated program of cutting. The adjacent age classes, those of from 21 to 80 years, will be somewhat beyond rotation age by this time, and therefore regulated cutting with sustained annual yields on a 120-

year rotation can be begun for this portion of the forest 70 years from now, and not much earlier. This fixes 70 years as the period which the present mature and semi-mature timber must be made to last before the younger age classes can be expected to participate in the budget. The mature and semi-mature age classes have volumes which are known or which can be estimated. They are as follows:

Age class	Area	Yield per acre	Total yield
Years	Acres	Thousand board feet	
200 plus	19,962	20.3	410,000
161–200	15,095	37	558,000
121–160	28,448	31.9	907,000
101–120 ..... (160 when cut)	15,016	37	550,000
81–100 ..... (130 when cut)	12,500	30	375,000
Total available to last 70 years			2,800,000

NOTE.—The area of the 81-100 year class which is to be included with the older age classes and cut during the 70-year period is taken by percentage from the diagram—5.5 per cent of the total area of 227,776 acres being approximately 12,500 acres.

The annual cut for the next 70 years can now be computed. It will be 2800 million board feet divided by 70, or approximately 40 million board feet per year. This cut will naturally be concentrated in the older age classes, and so distributed as to log as nearly as possible equal areas each year. As this cut must necessarily be spread over 70 years, some growth can be counted upon in the present 81-100 and 101-120 year classes. In making up the total available amount of timber for the 70-year regulatory period, as it appears in the above table, these classes were allotted for cutting in approximately their 130th and 160th year respectively and the appropriate yields as shown by the empirical yield data assumed. It is probable that they may be somewhat older than this when cut, and in any event the assignment of yields to these younger age classes will have to be a matter of judgment based on such data as are available.

At the end of this 70-year period the forest will be semi-regulated on a rotation of 120 years. Some 60 per cent of the forest, or 136,000 acres, will be ready to cut over on a 120-year rotation with a minimum yield of 27,500 board feet per acre; and 40 per cent of the forest, or 91,776 acres, will have been cut over and will carry an even gradation of stands from 0 to 70 years of age. The cut will go by area and, at this time, will be 136,000 acres divided by 120 years, or 1133 acres per year, yielding 27,500 board feet per acre, or a total cutting budget of 31 million board feet plus. This budget will have to be maintained for a further period of 50 years, when the oldest portion of the forest which was first cut over will be at rotation age and cutting can begin there. The cut from this section of the forest will also go by area and will be 91,776 acres divided by 120 years, or 765 acres per year, at the same estimated yield of 27,500 board feet per acre, or a total cutting budget from this section of 21 million board feet plus. The sustained yield budget from this time on will be the sum of the budgets from the two sections, or 52 million board feet per year.

This cut is perfectly possible and is conservative because it does not take into account the possible excess cut per acre in timber which will be more than rotation age when reached. There will be a very considerable amount of this in the younger age classes of both sections of the forest as can be seen from the

diagram. However, the cut from these younger stands in the first section will not be harvested until nearly 100 years from now, and those in the second section will not be reached until still later. It is hardly desirable to take these possible extra yields into account at the present time.

It is believed that this graphic method of presenting and studying volume and age-class data materially lessens the time and effort required to grasp the management problems surrounding the assessment of the cutting budget. Additionally it should make it much easier to examine critically any management plan and follow the reasoning upon which it is based. Alterations in the plan may often be required to meet changes in policy and the effect of these is most apparent if they can be shown graphically. If, for instance, in the case which we have been considering it had been decided that a heavier cut than 40 million board feet is required to meet a changed timber sale policy, the effect of a heavier cut can be shown at once on the diagram whereas it might not be very apparent otherwise. A heavier cut now means a shorter period for the removal of the older age classes, and this will at once drop the point x in the diagram to below the profile of the normal forest, indicating that it will be necessary to cut timber below rotation age at the time that timber is reached. If, for instance, circumstances called for the consideration of a present cutting budget of 50 million board feet then the older age classes will be cut out in some 56 years instead of in 70 years. This will drop the point x 14 years and indicates at once that the present increased cut can only be obtained by a plan which contemplates a short cut commencing some 70 years from now, continuing for some 20 years, and involving the removal of some timber at ages of only 106 years. The advantages and disadvantages of such a plan can be weighed and a decision arrived at. Without the aid of the diagram the consequences of adopting a plan calling for a heavier present cut might not be apparent without considerable calculation.

SOME MENSURATION PROBLEMS IN LOGGING[1]

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MENSURATION as it applies to the pulp and paper industry can be conveniently divided into four heads: first, measurement of standing timber; second, measurement of wood in the bush; third, measurement of wood in transit; and fourth, measurement of wood at the mill.

Problems connected with measurement of standing timber—cruising methods, volume tables, growth studies, and so on—are omitted from this paper, which is presented with the idea of indicating some of the mensuration problems of immediate interest to the woods operator, such as those dealing with check scaling, checking fraudulent practices in scaling, determination of quantities of wood in rafts, and effect of churn butts on scale. The majority of the problems cited are concerned with scaling.

The method of scaling wood varies to a marked degree among different pulp and paper companies and in different localities. Where limit wood is cut the Crown ordinarily stipulates how wood is to be measured or does the measuring itself in order that proper returns may be made for stumpage. For convenience the company generally adopts the government method for its own use, sometimes with conversion factors to convert wood quantities to a more workable basis. The particular method used has generally developed over a period of years, and each company, or each scaling division of each company, is pretty sure that its method is the best one in use.

In general, pulpwood in lengths over 8 feet is measured by either the board foot or the cubic foot. In lengths under 8 feet, taping to determine the cubic foot content is the ordinary practice. The Quebec rule is the most common board foot measure of pulpwood in Canada and is the standard Province of Quebec rule. In scaling, the small ends of the logs and the lengths are recorded and the board feet determined from the rule. With logs in skidways, two scalers are required, one of whom tallies.

The cubic rule is the recognized pulpwood rule in Ontario. This rule is based simply on the cubic volume of cylinders and, in scaling, a scaler and a tallyman record lengths and diameters inside bark of logs on one face of the skidway. The assumption is that over a number of skidways there will be as many small ends as there are butt ends on the faces scaled. The scale, then, gives the cubic volume of a number of cylinders whose diameters equal the middle diameters of the logs scaled.

Other rules used in the measurement of pulpwood logs are the Scribner and the New Brunswick, though these are not all. The Doyle rule is the Ontario sawlog rule. It is a good one by which to purchase pulpwood, if you can persuade the vendor to sell on this basis.

[1] Presented before the winter meeting of the Woodlands Section, Canadian Pulp & Paper Association, 1928.

Pulpwood in short lengths is stacked and taped, 4 feet by 4 feet by 8 feet constituting a standard cord. Wood is frequently cut or sold in lengths to conform with grinder measurement. Thus for 32-inch grinders, bolts may be cut 63 inches, and halved. Also, some unit other than 128 cubic feet may be adopted as a cord.

The scaling organization is usually headed by a chief scaler, who either reports directly to the manager or to the head of a branch under the manager. His personnel consists of the necessary office force and the required number of check scalers, scalers, and tallymen. The office force checks and enters the scale as it is turned in by the scalers, handles shipping records, and makes up returns for the Government, together with a dozen other duties. With this very general review of pulpwood measurement practice, we may now turn to the problems involved.

Quantity Cut Prior to Scaling

The scalers are usually not sent to the camps until they have been operating for some time and have a considerable quantity of wood put up. An operation may start September 1. The chief scaler cannot economically send his men on to the job immediately and it may be November 1, or later, before he considers the camp has sufficient wood put up in condition to scale. Meanwhile the management requires periodic production reports from the camps as soon as the operation starts. Weekly costs are valueless unless written against correct production. Without knowing what the camps are producing during the fall period the operators are unable to tell whether the camp is behind or ahead of schedule, whether it needs more men or horses, or whether it needs assistance in some form. The jobbers and foremen cannot determine whether they are paying too much per piece or whether the men would be better on day work or some other basis. At best, the log run per cord or per thousand feet is now being guessed at. There is a very apparent need of a means of determining accurately the average log run or content per piece from the start of the operation and before a scale is secured.

Check Scaling

The check scale is a necessary evil in wood measurement. The men chosen to check scale are usually old experienced men on pulpwood and particularly experienced on the locality and type of timber being cut. The check scaler often acts as assistant to the chief scaler or field manager of the scalers in his district.

The amount checked varies from a very few per cent more or less unsystematically done to a hundred per cent. The allowable error between the scale and the check scale is also subject to variation. There are a number of reasons why the check scaler cannot get the same answer as the scaler and vice versa. Aside from rot in the wood, the human element is probably the greatest cause for difference; the result depends upon how the scaler happens to be feeling at the moment, how the weather is, and whether he is rushed, or careless. Fire-killed wood usually looks much better on a dry day than it does when wet. Balsam when lightly infected with red heart rot will show the characteristic pink on a fresh saw cut; in most cases,

after two weeks this surface bleaches to show not a sign of rot. Further influencing factors are cull, slant cuts, wedge cuts, and churn butts. With these in mind what degree of variation is allowable? Further, what should be the correct amount required to check? There is a point where closer checking is impossible due to the personal factor and to conditions inherent within the wood, and there is a point also where more precise checking is only a waste of money.

Improvement of Culling Practice

If all logs were of the same length and taper, perfectly sound, and sawn square, scaling would be entirely mechanical. When rot and defects appear, however, scaling becomes more difficult. Certain deductions must be made in the measurement or the stick culled outright. Deductions are made in a number of ways. The diameter may be reduced or the length decreased. Sometimes a log is culled outright and the next one accepted at full measure when both were half rotted according to the culler's judgment.

In culling pulpwood the culler has only his judgment to guide him in making the proper deductions. The chief scaler will tell him the company's policy with regard to the various rots and defects and how deductions are to be applied. These instructions and deductions are fine for sawtimber but are they so good for pulpwood? Do not scalers chiefly cull pulpwood the way they would sawlogs? It is only in comparatively recent years that such a person as a pulpwood scaler was recognized. Sawlog examinations qualified a man for any scaling, pulpwood included. Fairly recent investigations into the cellulose destructibility of various rots show that certain rots are not particularly detrimental to paper manufacture, whereas they produce useless lumber. Much work has been done and is being done on this question. However, coöperation with forest pathologists and the paper mills is required.

Determination of Cull Factor

Aside from rot, wood is dead culled when undersized. The log may be below the minimum allowable diameter. The scaler ordinarily keeps a record of the number of dead culls which include culls for rot, undersize, and other defects. No record is kept of the amount deducted on accepted logs during the scale. Accordingly, we are never in a position to determine exactly the cull factor for specific wood. Scaling presents a lot of possibilities in the determination of cull factors for use in estimates of standing timber. It is difficult to demand of scalers more than they are now doing; however, some means is required of determining total cull without adding excessively to the bookkeeping. Trees left standing on the cut-over area constitute an element of uncertainty in comparing timber estimate and actual cut, as does the timber cut and left at the stump, which the fellers will not risk bucking up due to heavy rot.

Effect of Slant and Wedge Cuts and Churn Butts on Scale

Log making has a regulating influence on resultant scale. The cross-cut saw handled by two men usually gives ends squarely cut off. The one-man saw, on the other hand, is very prone to pro-

duce slant cuts, particularly in felling. This is not necessary, but it is human nature. The men will not get their backs down to it in deep snow. In road construction, however, stumps must be cut as close to the ground as possible with the result that a number of logs are produced with churn butts. When areas are being hot-logged the quantity of these churn butts becomes considerable. Axe work in log making is best limited to notching only. Logs cut off by axes always creep into the total, however, and the wedge ends resulting are nearly impossible to scale correctly.

We all have regulations covering manner in which logs are to be made, diameter limits to cut to, and size of stumps and tops. We would like to see stumps cut as low as possible, but do we know whether the increased yield secured is being properly scaled? That is, is the abnormally high scale on churn butts compensated for by the increased utilization secured. This, of course, applies only to the cubic scale. The board foot rule, measuring small ends only, gets this flare gratis. The slant cut, on the other hand, always tends to increase of end area, which results in recording bigger diameters than actually exist.

Elimination of Fraud

Certain regulations must be enforced in the handling and treatment of pulpwood in order to facilitate measurements. Thus wood should be piled in such a manner as to make its scale as simple and accurate as possible. Long logs are usually piled in skidways with one face flush. When 12-foot and 16-foot logs, for instance, are being cut, they must either be piled separately or the 12-foot logs in a compact bundle on top or behind the skidway of 16-foot logs. Short wood is piled with ends flush on small skids in bunches containing a cord or more. When loaded on rack cars the two outside faces must be flush. Box cars must be filled with symmetrical tiers. Wood piled on ice must be on skids and further should be scaled before sinking.

Throughout these steps attempts are frequently made to beat the scale. Fraud appears in a dozen ways. Usually it is detected before becoming too serious. Sometimes after the scaler has left the producer saws a thin cross section off the ends of the logs, thus removing hammer marks or scale marks. The sawdust and ends are caught in a bag. The producer then hauls this wood to the dump and when the scaler comes around again he has a fresh skidway to measure, to all appearances. Sometimes, after long wood has been scaled, the producer bucks it into 4-foot lengths and sells it elsewhere. Where paint or crayon is used to mark ends he sometimes scrapes it off and rubs dirt on the ends. Short pieces are sometimes piled with long logs when the cubic rule is used. These are hard to detect unless each log is hammered. In a scale on the cubic foot basis one face only is scaled; accordingly the more butt ends on the side scaled the bigger the scale. Producers have been known to turn logs to get this result. The experienced scaler, however, immediately scales the other end of the skidway. Churn butts are carefully piled in this skidway, and as for slant cut wood, the more the merrier, since the producer can't lose. Short wood is sometimes piled to produce lots of air spaces, big knots are left on, and rotten ends turned

away from the flush side. Where the producer is working for a more or less square-shooting, lenient individual, he may try to flood his wood on ice before the scaler arrives in expectation of a later advantageous settlement. Holes are cut in the ice around the skidways to secure this result.

There are many other schemes to beat the scale. Above all we have the producer telling the scaler what a good fellow he is. With an effective check scale, corruption of the scaler is not possible without also corrupting the check scaler. Usually, neither can afford to go crooked since these affairs have a habit of coming to light sooner or later. The only problem involved here is the acquiring of a record of all possible means of fraud, so that the scalers may at all times be on their guard.

Yields and Costs in Short Wood and Long Log Operations

It is pretty generally recognized that a greater volume of short wood than of long logs can be cut from a given area. This presupposes the same minimum diameter in both cases. The choice is sometimes presented as to whether an area shall be cut into 4-foot wood or into 16-foot logs. For example, the type is black spruce swamp and the estimate shows it to run 12 cords per acre based on the production of 16-foot logs. If we want to cut this area into 4-foot wood what would be the increased yield? To carry the investigation a step further, what are the different yields when cutting to different minimum diameters? An investigation of this nature would show first all our recognized timber types; next under each type there would be a series of tables representing the entire range of stand per acre built around a standard, say the 16-foot log. To the left and right of this standard would appear the yield per acre of wood cut 4 feet or less and up to tree length. The same classification would cover the different yields from cuttings to differing minimum diameters.

Closely associated with the above problem is the determination of the costs involved and the different volumes secured when short wood and long logs are cut. The shorter the wood the more pieces are involved for a given volume, and the more pieces the greater the cost of scaling. This assumes that the shortening does not put the wood into the 4-foot class, which is taped and is low cost wood to measure. On the other hand, the more pieces involved, the greater the brooming allowance. If brooming allowance is not entirely utilized in the drive there is a gain. If more than the allowance is lost there is a loss in the cutting of shorter wood. If the log rule gives a consistent over-run on each log measured will the cutting of shorter wood, thus increasing the number of pieces, give an increased over-run for the same volume? An increase in the number of pieces gives a greater number of faces to scale. It is claimed that the scale is higher in short logs, if each piece is measured. Further the more faces there are to measure, the more slant cuts there are to lead the scaler astray. A patchy rot running intermittently up the stem may dead cull a long log whereas one or more sound short logs might be cut from the same piece. This problem might be dealt with by establishing a standard volume or cost and grading the

various lengths of log above and below this standard.

Much has been done in determining the relative cost of producing small and large timber. These investigations have been made on sawtimber with minimum diameters of 8 to 10 inches; the cost of the various steps from stump to finished lumber is shown, and the increased costs in the smaller diameters are clearly demonstrated. We cut pulpwood down to a minimum diameter of 3 and 4 inches; the finished product is radically different. In one case we want lumber; in the other cellulose fibres. When cutting to a minimum end diameter of 3 inches, there results a mass of small logs most of which are from the tops. Small logs affect the quality of the sawed product, and small top logs affect the quality and quantity of cellulose output. Fibres are shorter and numerous knots reduce yield. There are many factors applying to small diameter wood that do not apply to large wood. There is a greater percentage of sapwood in top logs; there is possibly higher sinkage and there is increased handling of small wood in the mill. The increased cost of producing small wood starts at the stump and does not end until the wood is pulped. An example is cited of the cost of cutting small diameter wood. In order to get as close utilization as possible, 8-foot logs to a 3-inch inside bark diameter were to be cut in conjunction with the regular 12-foot and 16-foot production. The 16-foot logs ran 26 pieces per cord and cost $1.75 per cord to cut, while the 8-foot wood out of the tops ran 189 pieces per cord and cost the jobber $5.40 to cut. This subject is a far cry from mensuration; however, there is enough measurement involved in it to warrant its inclusion as a mensuration problem.

Wood Lost in Drives

After wood has been measured and leaves the dump on its drive, all accurate record of quantities is lost. This is unfortunate since it is extremely important to know what is in a raft, reserve, or jam. Logs are lost out of rafts, booms break, and logs are spilled over a big area. It becomes sweep wood with no accurate measure of its quantity as it accumulates from year to year. A means of determining quantities of wood in transit is desirable. Something might be done with the acreage system.

The big source of error in water delivery of wood between the stump and the mill is sinkage. Studies are now being made which will give us information regarding the sinkage in pulpwood. We need these not only for each pulpwood species but for clearly defined pulpwood localities. The wrong sinkage factor is the cause of huge error in all water wood inventories. Rarely does a mill clean up all water wood and reserves, so that a check can be made of this factor. Common practice is to deduct a definite percentage, either annually or for a specific quantity of wood, according to length of time the wood is in the water. The effect of sinkage on inventories and wood balance statements is very far-reaching, since the wrong sinkage factor means a cumulative error as one year's operation follows the next. Eventually, when this situation exists, the mill wakes up to find no wood at a particular point where the books indicate there is a run of logs for a month or more. This study should include the effect on sinkage of

cutting at various seasons of the year and the effect of the position of the log in the tree.

Determination of Wood Used Daily by Mills

When wood arrives at the mill either it is scaled, or the mill works back from air dry paper production to determine wood consumption for the day. Weightometers and other means are used by some mills to assist in this. There are possibilities of error in most systems used. Pulpwood after it loses its bark is extremely difficult to identify as to species without microscopic examination. Most mills base their digester and grinder capacities on a single definite percentage of spruce and balsam. If the percentage of balsam is increased the daily yield may drop off and the mill tabulations will show a decreased consumption for the day, though there were as many cords or board feet used as previously. These factors tend to upset accurate calculation.

The problems listed constitute but a fraction of the problems that we could dig out if all of us went after them. However, a start has been made and if this list is of any help in defining other problems of a similar nature connected with woods operations, its purpose will have been achieved.

THE DECAY OF HARDWOOD SLASH IN NORTHERN NEW ENGLAND

By PERLEY SPAULDING

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FOR SEVERAL SEASONS the writer has been engaged in a study of the effect of lopping upon the decay of slash in northern New England. Because of the fact that most of the early cuttings by the Forest Service in the White Mountain National Forest were solely for softwoods, the slash of those early cuttings has not generally been available for this study, which was aimed more especially at the hardwoods. An apparently simple job has really been difficult, largely for lack of suitable material with which to work. For the future, this trouble is remedied by the establishment of plots solely for this purpose. Several series of plots have been made beginning in 1926. Each plot is two to three and a half acres in area; the conditions are as similar as could be found. But, while these will give results several years from now, they give us no immediate answer to our problem. Hence an effort has been made to arrive at a tentative solution by study of different aged slash located under various conditions. Since cutting has been done upon the White Mountain National Forest by the Forest Service, lopping of hardwood slash and burning of the softwood slash has been required of all operators until recently. This furnishes some hardwood slash which is lopped, but none that is unlopped. Outside the Forest lopping is unknown; here there is plenty of unlopped slash. Thus it has been nearly impossible to find both kinds of slash of the same age and species in the same locality, and situated under the same conditions of environment. At first, contradictory evidence compelled longer continuation of the investigation than was expected. This now seems to have been a fortunate circumstance leading to a much better comprehension of the entire problem than otherwise would have been the case.

In considering the decay of slash, we find that there are important and potent factors governing the rate of decay, which are active in every place that slash may be. These may be enumerated about as follows: the species of tree furnishing the slash; the rate of growth of the tree from which the slash came; the season that the cutting is done; the kind of soil upon which the slash rests; direction and steepness of slope where the slash is located; the elevation of the place; the moisture of the soil and of the surrounding air; the heat of the sun received at that spot; the canopy or cover, or both, not only as to degree but as to species forming it.

The Species of Tree Furnishing the Slash

In northern New England there are about ten important hardwood species,

and about as many more that occur occasionally. The minimum to be considered is ten, while more could very profitably be included. But these vary much in the durability of their wood, and consequently in the time required for the slash to rot, even under the most favorable conditions. The wood of one may rot, but not disintegrate, in 3 or 4 years, while that of another may persist for nearly as many decades. Lopping in the one case obviously will not be as efficient in time results as in the other case —if there is any real difference due to the lopping. The tree species are tentatively ranked according to the durability of the slash as follows, beginning with those of least durability: aspen, poplar, paper birch, basswood, beech, maple, yellow birch, ash, oak, chestnut.

The Rate of Growth of the Tree From Which the Slash Came

Everyone knows that individual trees of the same species do not grow at the same rate. But many do not know that, in general, wood which grew fastest will rot most readily, other things being equal. This holds true of slash as well as of the timber of the trunk. Some very striking instances of this have been seen. Undoubtedly, some of the difference is due to the relatively greater amount of sapwood in thrifty trees as compared with stunted and slow-grown ones. It is well known that, with the exception of a few species, sapwood rots much more quickly than the heartwood of the same tree. There is little or no difference between the sap and heartwood of aspen, poplar, and basswood in their rate of decay. To these should be added willow, but this is of practically no importance in this region. Species showing moderate differences in the rate of decay of the sap and heartwood are paper birch, beech, maple, and yellow birch. Those showing decided differences in rate of decay of the sap and heartwood are ash, oak, hemlock, and chestnut.

The Season That the Cutting Was Done

Wood cut at different seasons in the same year varies in its rate of decay, at least in certain instances. With the exception of wood cut for pulp and peeled at the time of cutting, practically all cutting in New England is done in the winter when snow greatly helps in getting out the timber. Cutting may begin in the fall, but not until the trees have made their growth for the season, and usually it stops in the spring before growth begins. Thus, cutting is done under essentially the same seasonal conditions. Hence, in this study this factor did not have to be considered.

The Soil

Practically nothing is known of the effect of the character of the soil upon the decay of slash lying upon it, except in connection with its heat and water relations. This is another of the forest soil problems which needs investigation. In general, sandy soil is warmer than clay, and the water is more readily given up by the sandy types.

The Slope

The steepness of a slope upon which slash lies is important in that it largely controls the amount of heat received from the sun, the amount of water which can

be absorbed before running off, the height of the water table in the soil, and the amount and kind of soil that can lie in position on the slope. The nearer the angle of a slope is to a right angle with the rays of the sun in the hottest part of the day in summer, the warmer will be the soil surface and the vegetation upon it. Here in the Northeast this is quite an important factor for consideration. The amount of water retained by the soil directly controls the rate of decay of slash. A steep slope is apt to be also a dry one, because the water largely runs off before it can soak into the ground. Where there is a steep slope the water table is apt to be close to the bed rock. But in such situations real soil is also apt to be relatively thin, so that the water table may actually be quite close to the surface and readily available. Our steepest slopes are apt to be also high in elevation, and to belong in the spruce slope type. This type is usually characterized, when facing the northern half of the horizon, by high temperatures in midsummer, and by excessive dryness, especially just after a stand has been felled. When facing the southern half of the horizon, especially where there are high ridges to the north which cut off exposure to the sun early in the afternoon, it is apt to be quite moist. In the one case slash is apt to dry out promptly and remain resistant to decay for long periods of time. In the other case, slash is apt to become water-logged and resist decay equally long. From the standpoint of decay alone, it is a question which is to be preferred.

The Elevation

The elevation of the slash area directly influences the rate of decay, since the length of the season when fungi can grow is directly controlled by it. It is likely also that the intensity of the action of fungi is greatly influenced by it. It is well known that the heat of the sun in midsummer is pronounced at higher elevations. This creates a condition of dryness which slows down decay, while the short warm season prevents regaining a normal rate of decay before and after this period, so that the total result for a period of years is a decidedly slow rate of decay.

The Moisture of the Soil and Air

As already intimated, the moisture of the soil directly affects the rate of decay of slash. Fungi cannot grow without a certain amount of water; neither can they grow in wood which has more than a certain water content. This is undoubtedly correlated with the air content of the wood, which is inversely affected by changes in the water content. Slash lying upon over-wet soil becomes water logged. This, however, greatly varies for different species of wood. Some are very prone to absorb and retain an excess of water, while others are equally resistant to this process. Data from my observations show that the species studied rank about as follows in this respect, grading from those easily water-soaked to those most resistant: yellow birch, hemlock, beech, basswood, maple, poplar, oak, fir, chestnut, ash, spruce. As a rule, soils which usually are of the right moisture for good corn or potato production are also of the right moisture at the surface for the best development of wood rotting fungi, and for the rapid decay of slash.

Moisture in the air surrounding the slash is also a potent factor in its decay.

Situations where the air is continually overloaded with moisture will produce water logging as certainly and about as quickly as those where the soil is wet. In fact, the two conditions are apt to accompany each other.

The Crown Cover

The shade furnished by standing trees and shrubs regulates the moisture in the underlying soil to a considerable extent. Complete lack of such cover, as occurs where a clear cutting has been made, often leads to excessive drying of the soil and abnormal heating by the unobstructed sunbeams. Where a selection cutting is made and the crown cover broken, or even reduced a half, conditions are apt to be favorable for rapid decay of slash. Much, however, depends upon the other environmental conditions, as they directly affect the action of the crown cover on the fungi.

The Ground Cover

Unless scattered, the slash is not commonly much shaded by the ground cover, so that its action is largely indirect, by affecting soil conditions adjacent to the slash piles. However, it shades slash from the sides except when the sun is directly overhead. Heavy ground cover on soils naturally inclined to be wet holds the moisture in and tends to accentuate dampness and produce water logging of slash. On a sandy type of soil, heavy ground cover holds the water content up to a point that is favorable for rapid decay.

Heat

Heat is so inextricably connected with most of the other factors which have been discussed that it is difficult to present a specific statement concerning it. All wood rotting fungi must have a certain amount of heat if they are to grow. Their thermal requirements are not yet well determined, but we know that practically no growth is made at freezing point. Many thrive at 30° to 40° C. Some certainly do at somewhat lower temperatures. But, in general, if the range from 30° to 40° C. is exceeded, or is not reached, some of the fungi are absent. To the same extent the decay of slash is delayed by temperatures varying in either direction from those mentioned above. Relatively small increase above 40° C. will slow the growth of the fungi so decidedly that decay is greatly delayed. Reduction of temperature below 30° C. will not so soon retard decay, but if the temperature is much reduced there will be a decided slowing of decay.

Hence we find that decay is excessively slow in situations where the heat is abnormally high, as on high spruce slopes, sandy, white-pine lands, or especially dry soils with leachy tendencies. This is partly due to early seasoning of the slash and its consequent resistance to decay. On the other hand, in especially cool places, water logging occurs so easily and is so prevalent that decay is delayed by it alone. Just what may be the direct effect of the temperature, aside from its action on moisture, is unknown, as it is so difficult to separate the two factors in experiments with wood. Under rather unusual conditions in northern New England, it is believed that the sun's heat may have a sterilizing effect during the hottest part of the summer. But at other times of the year, such localities

may have just the right temperature for rapid decay, and thus the average rate of rotting may be nearly normal.

Conclusions

After due consideration of the effect of these various factors controlling decay of slash the following conclusions have been tentatively reached:

The effect of lopping varies with the species somewhat as does the durability of the wood of the species. The less durable species show the smallest differences between lopped and unlopped slash, simply because the wood rots quickly in any case. On the other hand, the more durable species will yield maximum results from lopping because the normally long rotting period can be shortened by proper handling. The ranking of the species is as follows, beginning with those showing the least difference between lopped and unlopped slash: aspen, poplar, paper birch, basswood, maple, beech, yellow birch, ash, chestnut, red oak. Lopping of the last three species, under favorable conditions, may be expected to hasten decay somewhat.

Liability to water logging under usual conditions makes it questionable whether lopping is of any benefit with some species. This is especially true of yellow birch, the bark of which seems to retain all moisture and yet does not seem to prevent its being taken up by the wood. Beech, maple, and basswood are less liable to water log, but do so frequently enough to influence decay. Lopping of these species in most situations is of questionable value.

Certain species will hardly water log under the most extreme conditions. These are ash, chestnut, and red oak. Slash of these, if left to rot, could very well be lopped, as decay will be hastened somewhat by so doing.

UNCLE SAM, LANDLORD[1]

By E. S. KEITHLEY

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IN A GENERAL sense Uncle Sam, prior to the National Forest idea, functioned largely in the capacity of realtor—that is, his primary purpose was to pass all lands to private ownership as rapidly as possible. With the development of the National Forests he has become more landlord than realtor, in that he now seeks to retain title to a considerable portion of the public lands and to permit of their exploitation and development under some form of lease or control. This change from realtor to landlord is not in any sense complete. He is at present both realtor and landlord, the latter, however, predominating.

This subject is far too big to handle in its entirety. To localize it and analyze its significance in relation to the National Forests is in itself a sizeable job. For purposes intended in this paper I must quarter it down further and ferret out that form of use which literally the American people have gone wild about, namely, recreational use. A diagnosis of even this small sector of Uncle Sam's anatomy from the standpoint of realtor and landlord as previously defined is a handful. The processes at work in effecting the change from realtor to landlord are many and complicated.

In the mad rush for play, which is the common conception of recreation, the Forest Service organization was not slow in falling into line and telling the nation of the great playgrounds within the National Forests. Many claim this action was a matter of self-defense. The recreationists have found the opportunities in the National Forests, so we must provide for them rules, regulations, camp grounds with fireplaces, toilets, and garbage pits, lest they burn up the Forests and pollute the streams. Not content with handling those who seek the National Forests as playgrounds of their own accord, we call not only to them, but to all to come and play in the forests. Thus the Forest Service, instead of merely keeping in line, has assumed active leadership in the recreation game. Some Forests, feeling the urge to increase revenues, have been particularly active in recreational lines as a means directly or indirectly to that end. That these efforts have met with success is verified by the jealousy that a few attempted to stir up a short time ago between the National Parks and the Forest Service.

The rapid expansion of recreational use in the National Forests brought with it the summer home law (Act of March 4, 1915). Just what the sponsors of this law had in mind originally was Uncle Sam, realtor—not landlord as it turned out. What they really sought was to acquire title to five acre tracts anywhere throughout the National Forests; and

[1] Presented at the meeting of the Central Rocky Mountain Section, Society of American Foresters, Denver, Colorado, December 12, 1928.

the act was known for a while, at least to the average citizen, as the five acre homestead law, which to him meant one thing only, title eventually in fee simple to any five acre tract which appealed to him.

How soon we forget and lose sight of the original motives that prompt some of our laws. Many men in the organization did for a while oppose outwardly as much as they dared this new use of the forests. It interfered with the grazer, the timber operator, and the forester. The recreationist was careless with his fires and smokes. However, the grazer with his greedy herds destroyed the flowers, and the timber operator ruined the forest trees with his hunger for ties and lumber, and so those in the organization who were reluctant to accept this new form of use have now been engulfed in the onrushing tide of pleasure seekers. Everybody appears happy; peace and harmony prevail except for occasional rumblings. Various little conflicts are arising between one use and another, which cause some uneasiness for a time. These are being flattened out, at least temporarily, so we are shuffling along apparently not mindful of where we are going or that there may be dangers ahead. This is not unnatural; it is the easy thing to do.

Recreational use of the National Forest is here to stay, whether we want it or not; and the Forest Service organization, as custodian of the large acreages within the forests, cannot escape its responsibility. In accepting this responsibility we have built roads primarily for the recreationist, and even those not so built are extensively used by him. We have developed camp grounds, surveyed groups of lots for summer homes, and made elaborate plans; and as landlords we are out striving hard to make good—to attract more of these recreationists and lease them lots for summer homes and resorts. We are planning, presumably, as best we can to discharge this obligation. Our plans frown upon the hot dog stand and the cluttered up conditions that are so commonly found on privately owned ground. We seek ideals, the full appreciation of which is limited to a small minority. Has this any particular significance to Uncle Sam, Landlord? As realtor he feels and sees more the results of a majority. How long can he hold out against this majority as landlord?

It is not uncommon to find the group idea jarring to the applicant, in that it reminds him of a city lot. Nine groups out of ten have nothing particularly attractive—just ordinary mountain scenery —nothing conducive to the group idea except the gregarious instinct of man and the Service's desire to bunch them up as a matter of convenience. The very thing that folks living under crowded city conditions seek by coming into the mountains to establish a summer home is isolation. The number of such persons avoiding our summer home groups is increasing, and under this demand isolated single summer home sites are increasing. We have one in what was until recently the more remote and inaccessible part of the Pike Forest. (It was a case of a summer home or a mining claim.) Under this pressure, even with our expressed desire and effort to bunch them up, they are widely scattered. The forest is now shot-gunned with summer homes, resorts, fur farms, fish cultures, club

grounds, lodges, boy and girl scout camps, school camps, Y. M. C. A., and various other camps. What will it be 25 to 50 years hence? While we yet have some authority and power to control and designate areas which shall be used for recreation, how soon will appeals force us to give a man practically what he wants and where he wants it? How long can we keep on top of this new responsibility without jeopardizing our prime function? Forestry moves slowly. Recreation is developing rapidly. Will not its needs be fully satisfied first?

On first thought there is nothing to be alarmed about, but all these uses on leased lands are requiring an ever-increasing amount of supervision and inspection, which in turn must be followed with more exacting requirements. Uncle Sam, Landlord, must discharge his responsibility with fairness and as defined by regulation. He must look into the permittee's house as well as inspect his grounds. Tin cans, flies, paper, cast-off clothing, must away. Chimneys, stoves, and flues must be properly fireproofed. The garbage pit and toilet must be safe and immune from all the burrowing and digging animals that roam the woods in quest of food. These and other petty nuisances do not disturb the permittee greatly about his permanent abode, so why should they be serious matters away out in the mountain forests? So it must and does seem to many of our tenants, and they resent the intrusion of Uncle Sam, Landlord, into the privacy of their home affairs.

That there are dangers ahead in our leasing system is to be found in no less an authority than the report of the joint committee on Recreational Survey of Federal Lands, which states: "In many instances, therefore, the leasing of land for summer home sites may be looked upon as the initial step in passing these residential sites into private ownership." This report goes on to say: "Once a man has taken possession of a piece of ground and spent even a small sum of money for permanent improvements, he acquires equities which are recognized in the eyes of the general public and of the politicians, even if they are not technically recognized in the law." This can be made to apply to any of the various forms of exclusive or semi-public uses which we now have on the National Forests. Why not, when such use is putting the particular tract to a higher use than forestry? It is not stretching the imagination to predict private ownership of all exclusive use areas which we now have under permit as well as those to be so handled in the future. If patented and valid mining claims interfere with the administration of National Forests today, what will patented summer home and resort sites of from one to five acres add to the problem of administration in the future?

Forestry on National Forests today has been crowded back on to the most inaccessible and poorest soils in the United States. Are the approaches to even these inaccessible areas to be clogged and choked with this idea of putting land to its highest use?

I have no solution to offer nor changes to make in the present general policy. It should be made safe. The problem is with us, and we must keep on top of it. My aim here is to emphasize the necessity of directing this use wisely with full recognition and appreciation of the dan-

gers ahead. Is there anything we can or should do about this recreational use that is not now being done? Does it matter that these key locations valuable for such use should pass to private ownership? Can any man or group of men plan and direct this use in a manner that will avoid conflicts far in the future? Must the eliminating process continue under this guise of highest use until every acre of forest soils capable of producing a satisfactory timber crop is lost to public forestry? I think it is high time that foresters use every ounce of energy to the end that the National Forests shall henceforth be held sacred to the practice of forestry; that all lands now within them shall be made immune against any and all inroads under the guise of a higher use. We have already brought more land into cultivation than the country needs, and agriculture is suffering. It is probable that we have even now devoted too much land to recreational uses. Let us seek then the acquisition of more of this so-called marginal agricultural land for forestry and reverse the tide. Agricultural lands, and possibly lands put to recreational or other presumably higher uses, might well give way to forestry purposes wherever there is a conflict on National Forests. Let the recreationist come to the National Forests; we are glad to have him; but also let him know that here we practice forestry. We have not time to cater to his whims. He must learn to appreciate the music in the ring of the axe, and feel a thrill at the felling of the old veterans of the woods.

Already our simple camp ground facilities are inadequate, lacking in comforts and conveniences. I predict that another decade will practically see the end of camping out. Man is yearly becoming more modern, and loathes the bugs, ants, and flies at his outdoor lunch. He motors to the mountains in a closed car, having practically all the comforts of his city home. He lunches at the wayside inn, and puts up at the lodge or cottage camp for the night. It is absurd to me to think that such hothouse products will for long continue to seek the open camp fire. Roughing it is going as the horse and wagon have gone. It is like trying to bring back horseback riding as a popular sport in this motor age. It just can't be done with any degree of success even while the horse and mountain trail are still fresh in the minds of many vacationists.

Why is Uncle Sam in the business of timber growing? Why is the private land owner loath to practice forestry? It costs too much, and he must make a living during his short life. Then Uncle Sam can grow timber and let the private land owner handle the tourist crop and the recreationist which offer a quick turnover and ready cash. What about those thousands of acres of key locations now in private ownership on practically all National Forests where recreational use is heavy? Why not urge such owners to absorb more of this recreational use? Real estate men question our leasing of home and resort sites as an infringement on their constitutional rights—too much government in business. Anyhow the private land owner can better handle the recreationist; can cater to his demands; render the high type of service he seeks; and do it presumably at a profit. In our country the government should not do what the private individual or cor-

poration can do at a profit. When forestry pays a money profit, and it will on our better soils, public forestry must become insignificant, or else government in business must be made safe.

Forestry is our lot on these vast acreages of National Forest lands—lands which for the most part are unfit for private ownership. Anyhow there is little or no immediate profit in sight so far as the individual is concerned. The private owner now has the hide; let's save the tail for public forestry, and resist with all the powers vested in us further encroachment of any nature whatsoever upon the sanctity of our domain—the National Forests. Let us strive also to snatch away from agriculture those marginal lands and restore them to the ranks of highest use—forestry. We should lay our cards now and present a united front against any encroachment upon forest lands under that " bugaboo " of a higher use. Uncle Sam, Landlord, safe and permanent against all private plunderers! Make the recreationists see and appreciate that the National Forests are for growing timber—not playgrounds—yet they are welcome to play among the trees until harvest time. Then away to other trees for their play, or find pleasure in sitting on the stumps. I am told such use should be rotated anyhow. Let us put a conspicuous clause in each recreational use permit to the effect that the lands included in this permit have been reserved by Congress for the growing and harvesting of timber crops, and if a conflict exists between the recreational use of this tract and the higher use of growing timber, this permit may be revoked. If federal forestry is to succeed Uncle Sam, Landlord, must be made safe.

FEDERAL FORESTS, FORESTERS, AND RECREATION[1]

By E. W. TINKER

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IT IS POSSIBLE that many a forester in the employ of the Federal Forest Service would like to vision the management of a forest where each acre was like every other in topography and cover, and where he could without consideration of public need or public welfare practice his art and improve his craftsmanship behind the high fence of a total exclusion policy. This forester's millennium might be reached in connection with the practice of private forestry, but on public forests broader problems require broader vision and broader vision encompasses broader uses, that the original dictum designating the National Forests to serve the "greatest good for the greatest number" may be carried out.

Not to recognize the possibilities of development of economic and social values, and not to obtain their full development by proper stimulation and proper planning could be looked upon only as lack of intelligent management. Planning of coördinated uses is a delicately balanced operation if the utmost of good is to be secured, but it is a phase of National Forest work that foresters in Federal employ must recognize and become skillful in, if they are to sustain their reputation as capable forest managers.

Planning of coördinated uses within the National Forests is in its infancy, and as yet only the structural design of such plans has been made. In one or two instances such plans have been drawn but only after the problem became so acute that it could be met in no other way. Of particular urgency is the need for coördinated plans where recreational and timber use is involved, and where recreational and grazing use are conjunctive.

It is a little unfortunate that foresters as a class appear to have braced their feet and, to say the least, by passive inertia given evidence that they felt little inclined to encourage recreation within the National Forests, or in fact within any forest. This has probably been brought about to a large extent by a lack of care with fire on the part of recreationists. However, to a greater extent, in my judgment, it has been brought about by an inherent dislike characteristic of all engineers or semi-engineers to dealing with anything that cannot be measured in terms of figures or calculated on a slide rule.

It is my conviction that foresters and particularly public foresters had much better attempt to guide recreational development within the forests along charted lines of coördinated use than to attempt to stem the tide of recreation within the diminishing forests with the resultant increased concentration. Public

[1] Presented at the meeting of the Central Rocky Mountain Section, Society of American Foresters, Denver, Colorado, December 12, 1928.

forests are dependent upon public support for their existence and public support cannot be obtained in the full degree that is vital unless the fullest public enjoyment of the inherent recreation possibilities of forests is attained.

The planning of recreational uses in itself is a relatively simple matter. However, the planning of recreational uses when coördinated with other activities that are maintained ordinarily within a forest is indeed a complicated job. Perhaps that is why so little of it has been done. Recreational use in so far as it affects forest administration can be classified into three types: The first, and by far the largest, is purely the transient type. This type of recreationist seeks scenery, changed conditions and views, and possibly contact with wild life and economic uses of forests. Transient recreationists constitute only a small problem in planning, since they use the forest but temporarily and stop at public camp grounds or resorts only as this is necessary. It is difficult to say just how much the use of our mountain highways within the forests is attributable to the transient type of recreationist, but in Colorado, at least, I believe he represents by far the heaviest use and pays most of the cost in the form of gasoline tax. On some roads it is certain that transient recreationists represent over 50 per cent of the use. Without entering into a discussion of the subject the query is suggested, " How much thought and planning do we indulge in in locating our roads to assure this heavy user the maximum amount for his money? How much thought do we give, or have we given, in connection with the survey of our forest highway or forest development roads to other than purely economic or speed of travel purposes? "

Another type of recreationist within the National Forests may be termed the recurrent user. By and large, he is made up of the dweller in the adjoining community, rural or otherwise, who with his family picnics or fishes within the National Forests over his week-ends or periodically. Generally, he is a valuable coöperator, understands and appreciates National Forests, and is a loyal supporter of the policy of administration. A small portion of this element may be made up of sportsmen from far distant points, who through lack of understanding of the principles of administration of the National Forests may cause trouble. However, invariably the trouble he causes will be through over-enthusiasm for his own ideas of how recreation should be handled and lack of understanding of the principles behind the method upon which it is being guided. In but exceedingly rare instances will this type of recreationist interefere with the regular administrative activities of the National Forest.

The third type of recreationist, and the one requiring the most careful planning in the handling of his business, if recreation can be called a business, is the permanent forest user, such as the summer home owner, the resort owner, and the organization user who builds improvements upon National Forest land. Since these improvements are relatively permanent, their location may have a material effect upon National Forest administration in all its ramifications. Numerous mistakes have been made and probably are being made in the location of these improvements, and irritation and

interference are the results. However, this is no justification for the elimination of this type of user. It must be remembered that he is the only one that pays his way among all the recreation seekers. Planning and foresight will cut down conflict to a minimum and since the financial returns and public benefits are high the thought and foresight required appear to me to be fully justified.

Considerable has been said about the allocation for use as summer homes and resorts of forest land which should be kept for forestry purposes only, and devoted in perpetuity to the production of timber. An examination of the actual conditions reveals that this is really a minor item. In fact, the area involved is so small as to be practically negligible when its value and return for the use to which it is being put are considered.

In District 2 in 1927, reports indicate that the National Forests were used by 13,155 special use permittees and their guests, and by 249,396 hotel and resort guests. There were in effect on December 31, 1927, 242 cabin permits involving an area of 341.64 acres; 56 camps of various sorts were under permit involving the use of 633.07 acres; 7 church and mission organizations used a total of 8.53 acres; 6 hotels occupied 23.22 acres; 2 playgrounds used a total of 160 acres; 896 residences were covered by permits involving a grand total of 1,401.71 acres; and 110 resorts and club houses occupied 1,225 acres.

Surely, from the standpoint of acreage involved, an extraordinarily high use of the land is made. Careful planning will eliminate practically all interference with forest administration and even though all the land involved with these uses ultimately went to patent, if the uses are properly located in the first place, little interference with timber production or grazing use would result.

There is a crying need for interest and vision on the part of foresters in their plans of management, and more particularly public foresters looking to the intelligent handling of recreational use, the retention without defacement of scenic effects within the National Forests, and coördination of social with economic uses. There is need for more vision of a well ordered forest under intensive management, with well ordered recreation going hand-in-hand with economic development and use.

WILD LIFE ADMINISTRATION[1]

By JOHN H. HATTON

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WE CAN dispense, at the start, with the thought that wild life in the present stage of our country's social, economic, and industrial development may be allowed to shift for itself. We can drop from consideration, too, the "balance of nature" theory under which, in more primitive times, wild life could and did shift for itself and maintained its footing by species according to environment and adaptation.

Earth has been modified by human action. The so-called "balance of nature" has been disturbed. More than that—it has been definitely and permanently upset, and we may as well forget about its restoration, aided or unaided, on any broad or universal scale. We perhaps approach it in the protected sanctuary plan or the wilderness idea for comparatively limited areas, but wild life in its large and natural phases has become a problem for human thought and study and definitely organized administration, the same as our domestic and industrial pursuits.

Let us recognize that the present is not the past, and that we have new conditions for which to plan and with which to do. The present century cannot be substituted for the fifteenth or the seventeenth or the eighteenth even in matters of wild life. Let us then keep in mind that the development of a wild life program must take cognizance of our other pursuits; that there may be many localities where we would not urge the introduction or propagation of certain species of wild life and where conditions might require that they be dropped from consideration altogether. Would we, for instance, return the buffalo to his former haunts and in his former numbers? Obviously no! The buffalo has become a creature of parks and preserves and isolated and protected areas where he will not endanger human lives or interfere with our modern pursuits.

So, there must be studied and intelligent coördination and correlation and meeting of minds with concentration on the practical application of the question. Let us first have a right sense of proportion. There may be local situations where one or the other interests should have first consideration or even exclusive consideration, but in our American life and development we must find ways to live and let live because there is a definite place for all these supposedly conflicting interests.

The whole problem of wild life must have in our present day and age, therefore, a definite and intelligent program of administration. The people of this and future generations have thus inherited a definite responsibility as game keepers. It does not make any difference whether we are in public or in private life—whether

[1] This paper and the five following were presented before the Rocky Mountain Section of the Society during the winter of 1928 as part of its program for the study of game as a forest resource.

we are employed by the government or the state—whether we are in professional life, in business, or in other pursuits. All have their relative responsibility if we concede that wild life has a place in our American life. Without this thought developed into intelligent action our game would soon become extinct. It cannot survive and be permitted to shift for itself in our time. It must have the help of human leadership and guidance.

There is a growing demand for wild life by many classes of people. And there is need for wild life studies and wild life knowledge as a basis for intelligent activity. We must know something of our stock in trade not only quantitatively but specifically in order to develop a rational program. We must first assign wild life to its logical place according to locality and then agree upon an intelligent program of administration, which should be in keeping with our present day conditions and possibilities. I would divide wild life administration into two parts and would designate them:

1. Supervisory administration, which would have to do with the responsibility for game protection; and

2. Resource administration, which would deal with game as a recreational and productive resource in all its phases and relations.

Under the first subdivision I would include the responsible administrative agencies and the game and fish laws; under the second, all items bearing on game production and use.

We start out with the premise that wild life belongs to the states, in other words to the public. It would introduce a wrong principle to change that general premise; although in many places, practically, wild life has been reduced to private control if not to actual ownership. Some have advanced the thought that the administration of wild life will never be what it should until administered in a national way by the national government. On the other hand, I feel that the states should continue their present jurisdiction and should be given every opportunity and encouragement to handle wild life for the largest public benefit. The time will come when game will be handled more as a resource by the states themselves and when present concentration on law enforcement or the necessity for it will have gradually given way to the other and more important side of game administration—its development and use as a public resource. A number of states have already gone a good way in this matter. It is a poor commentary on wild life administration for a state or any administrative agency to devote the greater part of its activities to administering game laws. While that activity has its place, it should be a minor place eventually in all game management, because with the public imbued with a respect for game laws which will come through education and organization, the machinery of law enforcement is bound to take a less important place in game administration.

And let us dismiss from our minds this idea of conflicts in jurisdiction. There is a field for federal activity because of the interstate and national aspects of the game. There is also a field for the states and other agencies. Let us discard this bogey of states' rights, and dovetail state and federal supervision, both of which are essential, into an unselfish and intelligent program of administration in the practical interests of the wild life resource and the people of this country. I can cite

situations such as public lands and reservations where the states have a just right to call upon the federal government for help and coöperation in game matters, or where the federal government has its definite responsibility without solicitation, because of the federal jurisdiction in other respects over these immense areas. The states and the public should recognize this in the broader public interest.

So we have our laws by individual states, and we have certain federal laws and federal activity. For 27 years now the Biological Survey has been publishing a summary of federal, state, and provincial statutes concerning game and fish. In this "Game Laws" publication not only the specific provisions of the state laws but a review of current legislation by the federal, dominion, and state governments are included. Personally, I see in such a compilation and review large opportunities for a coördinated study of state and federal laws that might go a long way toward eliminating discrepancies and inconsistencies within states and on state border lines. I would like to see the Biological Survey, or perhaps the Forest Service or some federal agency widely and practically interested in the subject, assign one of its most competent employees to a constructive study of these matters in the field, among the states, and give him authority and instructions to meet with sportsmen's clubs and with all the prominent agencies interested in wild life, as well as to appear before legislatures to give law makers the benefit of such study and advice. It would be a sizeable job for some good man or men well worth while in the interests of wild life generally.

Next, then, to state administration would come federal administration of wild life in certain areas and places. Without question, the adoption and even the present inadequate administration of the Migratory Bird Law passed in 1913 has been the greatest single step toward migratory bird protection inaugurated on this continent. In addition to this, the Department of Agriculture has, under the so-called Lacey Act, been engaged for more than a quarter of a century in real game conservation. This act regulates interstate commerce in game, thus supplementing state legislation, and the importation of foreign animals and birds. The act has proved of material assistance in the suppression of illegal interstate traffic in game, and since its passage no injurious foreign species of bird or animal, so far as known, has gained a foothold in this country, as did the English sparrow and the European starling before its enactment.

The Biological Survey administers 72 game and bird refuges created for the protection of wild life, some by executive order and others by acts of Congress. All are bird refuges and five are stocked with big game. One of the latest and most important is the Upper Mississippi River Wild Life and Fish Refuge sponsored by the Izaak Walton League and under the joint jurisdiction of the Departments of Agriculture and Commerce, the lands for which are now being acquired by the Biological Survey. This and another refuge in Arkansas and one in Oregon are among the few now under federal control that are important as breeding, feeding, and resting grounds for migratory game birds.

The Migratory Bird Refuge and Marsh Land Conservation Bill, as sponsored by representatives of several conservation associations and endorsed by the

President's Outdoor Recreation Conference, has been kept before Congress, and if it becomes a law will make many times more effective the Migratory Bird Act. It would be a contribution to a definite federal conservation program which many sportsmen and conservationists feel is absolutely necessary if most of the achievements of the past decade are not to be lost. The effect of this law, to be sure, might seem to extend federal authority and administration of game. Still further strength would be given to federal administration by a bill before the present Congress providing for the creation of federal game refuges in national forests by presidential proclamation.

The Bureau of Fisheries, through the Department of Commerce, is an important example of federal administration in fish matters, and the work of this bureau is extensive and of large importance to the various states.

The responsibility placed upon the Forest Service by the Act of May 23, 1908, constitutes another large and important extension of federal supervision in wild life in all the National Forest states. It is perhaps one of the most, if not the most, effective contributions to game conservation because of its treatment of wild life as an essential forest and land resource, and because of the wide field of activity and jurisdiction.

Wild life management is largely a problem of food supply. The National Forests and other forested and adjacent or undeveloped areas furnish most of the remaining natural habitats of wild life. Thus, foresters are in an exceptional position and have a special opportunity in their studies of forest and range resources to make perhaps the largest contribution of any class of workers to this subject, without leaving out of consideration other important forest and land uses. There appears to be an inevitable trend toward strengthening federal supervision, particularly where international, national, and interstate questions, and public lands and reservations are concerned, and where state administration cannot effectively reach.

There is yet another factor in wild life protection and control which can hardly be called administrative and yet has much to do, both directly and indirectly, with game conservation over the country at large. I speak of private ownership in wild life. While it is true that any management of game by private owners or any so-called ownership of game is predicated on state and federal laws, actually the private ownership of game constitutes a large factor in the general conservation program, and must not be overlooked.

Then we have other direct and indirect coöperative agencies in the form of national, state, and local sportsmen's organizations. Perhaps one of the most prominent of such agencies at the present time is the President's "National Conference on Outdoor Recreation" which includes wild life as one of its most important considerations. It has already given definite attention to some of the larger, concrete wild life problems of the country. Its report on "The Conservation of the Elk of Jackson Hole, Wyoming" is an outstanding piece of work and has laid what seems to me the foundation for the right kind of studies in wild life, which could well be used as an outline guide for such studies by all agencies and organizations concerned with this subject. In thus commenting on the work of the President's Confer-

ence, I would not forget similar work and achievements by the Izaak Walton League in the brief six years of its existence.

I need not enlarge upon the value and place of sportsmen's organizations in creating a respect for law observance through the teaching of good sportsmanship and the coöperation they extend in various forms of game administration.

Summing up these various administrative and coöperating agencies we have under federal control five:

1. Biological Survey.
2. National Park Service.
3. Forest Service.
4. Bureau of Fisheries.
5. Canal Zone.

The mere mention of these five agencies does not, however, give us much of a picture of the immense field covered by them.

Under national and international organizations, we have eighteen:

1. American Bison Society.
2. American Game Protective and Propagation Association.
3. American Ornithologists Union.
4. American Society of Mammalogists (Inc.).
5. Associated Outdoor Clubs of America.
6. Boone and Crockett Club.
7. Camp Fire Club of America (Inc.).
8. The Game Conservation Society (Inc.).
9. International Association of Game, Fish, and Conservation Commissioners.
10. International Committee for Bird Protection.
11. The Izaak Walton League of America.
12. National Association of Audubon Societies (Inc.).
13. National Game Conference.
14. National Conference on Outdoor Recreation.
15. Federation of the Bird Clubs of New England (Inc.).
16. New York Zoölogical Society (Inc.).
17. Permanent Wild Life Protection Fund.
18. Western Association of State Game Commissioners.

The last is one of the more recent organizations, and its annual deliberations at different points in the western states, attended by state officials and the direct contacts that have been thus afforded with various state, federal, and other agencies administering wild life, have constituted perhaps the greatest single factor in breaking down state lines and establishing better concepts on this whole question. Time was when state officials were not permitted to travel outside of their borders for such conferences.

In the states and territories and in the Dominion of Canada and the Republic of Mexico there are 192 societies or organizations and departments giving attention to this subject. This record does not account for many more local associations and clubs that are not state-wide.

But the greater value of organized effort is in connection with the second phase of the subject—game as an asset and resource. This is by far the most important side of this question, and when I speak of the administration of wild life as a resource I mean that there are financial as well as utilitarian and sentimental aspects to the question. Why should the licenses received from sportsmen carry the load of wild life adminis-

tration alone? The resource itself should return even more than the proceeds for licenses and law enforcement. I can think of no better way to arouse and cultivate a universal interest in wild life than to place the public in a position to get more of the resource by spending their money for it in the field or in the market places. On public lands with game the property of the states but the lands the property of the public, why shouldn't certain proceeds be secured from wild life and returned to or used by the coöperating or responsible agency in further protecting and administering it?

I shall not, in the scope of this paper, attempt to outline in detail the various and intricate angles of the treatment of wild life as a resource as they appear to me. I believe its basis, however, should be:

1. Study of the history and present status of different species and their possibilities with relation to present day conditions and civilization.

2. Study of life history and feeding habits of game in its economic relations, and in its utilitarian and financial or income aspects.

3. Education and training—the collection and dissemination of right information about wild life and the building up of a general and intelligent sentiment on the subject. Game-keepers' schools should be established which will train candidates to take charge of raising game for state departments, sportsmen's clubs, and private estates. The Game Conservation Society previously listed announces the establishment of such a school in the spring at Clinton, New Jersey, the first of its kind in the United States. I am informed that the School of Forestry and Conservation at Ann Arbor will also emphasize wild life in its courses. This should undoubtedly be a part of forest training in all forest schools, not as an elective, but as one of the required courses. The public schools could have a part in properly training the young.

4. Establishment of federal and state refuges, or sanctuaries, and public shooting grounds as needed.

5. Simplification and codification of game laws in their bearing upon wild life as a resource, as well as from the standpoint of law enforcement.

6. Establishment of game farms and proper facilities for fish and game propagation and distribution.

7. Treatment and development of fur resources as economic assets.

8. Addition of game and fish scientists to all state departments and other administrative agencies.

9. Encouragement of private game farms and fish culture stations.

10. Organized control of "vermin" and different enemies of wild life, connecting up the fail spots in present inadequate organization.

11. Injection of wild life considerations into all organizations which regard wild life as in conflict with economic uses of land and resources, so that proper balances may be maintained and compensations made in different lines of endeavor in the proper interest of conflicts, actual or supposed.

12. Encouragement of sportsmen's associations. Their powers for developing wild life ideals, resulting in better law observance, dissemination of right information, and coöperation in sanely developing the game resource or controlling it, are almost unlimited.

13. Complete divorcing of politics from all wild life management.

In this discussion I have rather sketchily outlined my conception of the administrative phase of wild life and the basic considerations which it appears to me should underlie its treatment as a resource. I have not attempted any elaborate outlines for scientific studies of species. These must necessarily be left to investigators. As far as the Forest Service and its responsibility are concerned, it has comprehensive outlines for regular and current use. These provide for five-year plans and reports progressively, with the addition of special observations annually. I hardly see where the outlines can be improved upon in their major purposes since they cover the administrative field and go somewhat into the more technical observations as they relate to life habits or wild life conflicts. I believe the Forest Service, administratively at least, is in the lead of any similar organizations, and accomplishment will simply depend on how fully the field can or does make use of its opportunities for study under present policy and current instructions.

The National Forest Manual and the wild life handbooks give wild life an important place both in administration and among the resources of the forests, and provide for the fullest consistent cooperation with other agencies. Certain references to authorities are cited and brief descriptions recorded of the principal species of animals and birds indigenous to National Forest territory. As their names imply they constitute a working guide under accepted policies. So with slight modifications now and then as to detail as experience dictates, the Service is well set to go forward in assigning wild life its proper place on the National Forests and in giving it its logical share of attention. In fact, as administrative officers, I think that forest officers have instructions enough, if rightly interpreted, to carry their part of the responsibility. The Service has already studied and reported on various phases of game as a national forest resource. Among these special studies and reports are the retaining pond situation and possibilities, the beaver resource in its economic relations, the winter range problem, public fishing waters, the refuge question, wild life censuses, and others. More use should be made of this information by the states and other agencies, because it comes from first hand contacts with wild life in its natural conditions and environment, and in its relation to other resources and pursuits.

There is much literature, by the states, the Biological Survey, and various stations and schools, which furnishes real information and necessary basic knowledge. This needs to be classified and brought together for ready reference. There has been a fund of information accumulated by the Forest Service through the years, which is now being put into bulletin form. Some of the most important contributions have come from the Roosevelt Wild Life Bulletin by the Roosevelt Wild Life Experiment Station at the New York State College of Forestry, Syracuse, New York. Since 1922 seventeen bulletins have been issued covering thirty-eight subjects, besides the regular station notes. Another example is in the California State Game Department which has made valuable contributions on many forms of wild life. There are others, but these two come to me first.

Some central agency like the Biological Survey should prepare and issue a classified bibliography of all these sources of information similar to its " Game Laws " publication. Such a study would also make a good thesis for a forestry or biological student with a nose for thoroughness and accuracy, especially if the references included a summary statement of conclusions or accomplishments. This it seems to me is fundamental in any wild life program on a national basis. Our information is now too scattered and too unknown or inaccessible, excepting to the few enthusiasts who seek it out. As an example of what I mean, I refer to Volume 3, Number 4, of the Roosevelt Wild Life Bulletin previously mentioned which, in connection with its treatment of the subject " Importance of Animals in Forestry," lists 228 references. Then there should be some central publicity agency to see that current information is appropriately and systematically sent out to different sections of the country.

In conclusion, I want to reëmphasize the scientific or research side of game management, which I listed under basic considerations in resource administration. Let me quote from H. G. Wells on " The Value of Research ":

" When the intellectual history of this time comes to be written, nothing, I think, will stand out more strikingly than the empty gulf in quality between the superb and richly fruitful scientific investigations that are going on, and the *general* thought of other educated sections of the community. I do not mean that scientific men are, as a whole, a class of supermen, dealing with and thinking about everything in a way altogether better than the common run of humanity, but in their field they think and work with an intensity, an integrity, a breadth, boldness, patience, thoroughness, and faithfulness—excepting only a few artists —which puts their work out of all comparison with any other human activity. . . . . In these particular directions the human mind has achieved a new and higher quality of attitude and gesture, a veracity, a self-detachment, a self-abnegating vigor of criticism that tend to spread out and must ultimately spread out to every other human affair."

ARE WE DRIFTING INTO EUROPEAN SYSTEMS OF GAME MANAGEMENT?

By THEODORE KRUEGER
Forest Supervisor, Gunnison National Forest

AS AN illustration of European practices in game management, let us take the systems used in Prussia:

Private Lands. The larger private estates are generally used for hunting exclusively by the owner and his friends. The owner establishes the number he wants to kill during any year.

With lands owned by peasants or communities, as a rule, the peasants combine their holdings and lease the hunting privilege on them to the highest bidder. Generally the lease is made for a term of years. Often community forests or other holdings are pooled with holdings of peasants.

State Forests. As a general rule the game management on the state forests is handled entirely by the forest personnel. A game census is taken each year and the annual kill is established by the supervisor. All hunting is done by the forest officers, however, the meat is sold to public markets, and any one can purchase game meat in season. In the larger game such as deer and elk, two-thirds of the kill is allotted to the rangers and one-third to the supervisor. Heads and horns are given to the forest officer who kills the animal, but the meat is sent to markets designated by the supervisor. Receipts are credited to the forest.

Off hand, we would perhaps say "No such a thing in the good old U. S. A., here anyone who buys a state hunting or fishing license can go out hunting or fishing." But let us look closer and see if such is really the case.

How about the miles and miles of closed fishing streams and the ranches and other private property plastered with signs reading "Private Property—No Hunting or Fishing Allowed." How about the private lakes where so much per hour or so much per pound of fish caught is charged? I further understand from hunters that unless you have a lease on a lake or belong to some club that has, you are out of it as far as private lands are concerned, when it comes to duck shooting. So when it comes to private lands, it seems to me that our system is not so different from the one used in Europe; the only difference as I see it is that our farmers have not yet, as a rule, combined their holdings to lease them out.

It would seem that the National Forests and Public Domain are the last remnants of open hunting and fishing grounds which will be left to the average citizen of Colorado, who is not financially able to lease private hunting or fishing grounds. In this connection the question arises as to whether or not it would be of advantage if a system similar to the one used in the German State Forests were introduced on the national forests? The advantage of this system is that there would be an absolute control of the annual kill and that game meat, sold at

the public markets, would be available to any citizen, whereas, under our present system of hunting licenses, only a comparatively few citizens get to eat game meat, while others, who would like to, have no opportunity to secure it.

On the other hand, while it is true that under the Prussian State Forest system, game meat is made available to all people, the sport of hunting is enjoyed by a few forest officers only. In our country it would probably be handled by the state game wardens. As I see it, game is one of the products of the national forests, and hunting should be made available to the greatest number possible. Hunting and fishing are primarily recreation and the value of hunting lies not only in the meat secured but more especially in the recreation furnished. Furthermore, a considerable amount of money is put into circulation by hunters and fishermen in the purchase of equipment and supplies.

While I strongly favor our present system of licenses, in certain instances this needs adjustment. Take for instance the elk situation on the Gunnison National Forest. If an open season of only a few days were made for everybody, it would quickly mean the killing of what elk we have. Perhaps in the case of elk we shall have to come to a modified European system and issue a limited number of licenses only. The system of issuing a very few licenses at a high price has been advocated. This would make it a sport for a few selected rich men only, although it might be argued that at present wages even laborers in the United States come in the class of comparatively rich people. Others have advocated a system of establishing the number which should be killed during the year and then requiring hunting parties to hire a licensed guide, figuring that the employment of a guide would only be a small part of the expense of the hunt.

In the case of the deer, I believe that with game refuges and breeding grounds scattered well over the state in the right places, it will be possible indefinitely to have an open season of a few days and give everybody who wants to a chance to get out and hunt.

However, if we in Colorado decide that there must be restrictions placed on the annual kill, such as mentioned above for elk, it will mean real administration by those who are responsible for carrying on game management.

RELATION OF LAND OWNERSHIP TO OWNERSHIP OF WILD LIFE

By GEORGE A. DUTHIE
Forest Supervisor, Black Hills National Forest

THE wild life of the forest is so intimately associated with the forest itself that it seems logically to constitute a part of the property. Remove all wild life from the cover and waters of a forest and you will have a dull and listless place indeed. It quickens the atmosphere of the woodland and imparts to it interest, charm, and romance. It converts the forest from wilderness into a dwelling place of creatures, the presence of which is betrayed in many ways to the human forest traveler even when not actually seen by him. This wild life presence creates for the forest an attractiveness of high esthetic value.

Some of its wild creatures prey upon the forest; some cultivate and protect it; while still others, neither destroying nor protecting it, yield fur, meats, and hides of great commercial value which may properly be considered forest products. All classes of this wild life contribute to the balance of nature and all of them, taken collectively, whether bird, beast, fish, reptile, or insect, constitute, broadly speaking, the wild life of the forest.

Ownership of the destructive insects and rodents has never been a disputed matter. No one cares to claim ownership and every one would be glad to shift to another the burden of control.

Insectivorous birds and reptiles are welcome inhabitants. Their chief worth lies in their beneficial acts rather than in any commercial value of the creatures themselves. They have, to be sure, a limited esthetic value but this also is measurable only by reason of their association with the real property. There is consequently no controversy as to who shall own or control these creatures.

The wild creatures having the greatest esthetic appeal, probably because they have a direct commercial value, are the game birds, fish, and mammals. They are the fur bearers and the meat and hide producers. They are the creatures usually meant when we use the term "wild life." They have the highest esthetic value as well as a high commercial value; therefore, ownership is coveted by all who have any basis for the claim.

In Europe there is a well-recognized principle in law handed down from feudal times that ownership of the game is in the owner of the land, who has complete control of the wild life property insofar as he is able to maintain control. The first protected forests were established under this principle for hunting preserves.

In the United States the supervision of the game, its protection, and the regulation of its use are by the states. This right is disputed to a limited extent by private land owners who claim that ownership of game that is propagated upon and draws its sustenance from the land should lie in the land owner. The weak point in this claim is that all game in its natural state is more or less migra-

tory. If the individual would maintain ownership he would have the right to pursue and take his property where it could be found, but he would not be entitled to take the game property that had escaped from or that had been propagated and had remained upon the land of his neighbors. In order to maintain ownership to property one must be able to identify it, and this cannot be done in the case of wild life. Furthermore, it is abhorrent to the principles of a democratic government that ownership of a great natural resource should be vested in a few individuals to the exclusion of the general public. The right of the public to share in this resource is an inalienable one and to insure protection of the public interests it must be regulated. Regulation of a migrating property would be clearly impossible if the regulatory measures applied only on public land. It must apply wherever the property is found. In other words, governmental regulation must extend to the wild life on private as well as on public land.

There remains the question whether this regulation should be exercised by state governments or by the federal government or by both. The answer should be based entirely upon the public good. Which form of governmental regulation will best serve the public interest in the use of the resource? Can the wild life be better propagated, protected, and made available to general public use through state regulation, or under federal supervision, or will divided authority exercised by the one or the other, according to the peculiar conditions of each problem, prove more efficacious?

The history of game protection has been almost entirely one of state control. In some states this control has been efficient and good, in others it has been inefficient. The chief trouble with state control has been due to political considerations. Where such conditions prevail law enforcement is inevitably poor.

Pennsylvania and New York are two states which are frequently pointed to as having set a high standard of wild life protection. Here the administration of the game laws has been divorced from politics. There is a growing tendency throughout the country for other states to abandon the old politics-ridden commissions and adopt non-partisan forms of administration fashioned somewhat after the form used in Pennsylvania. Where politics has been eliminated there has invariably followed marked improvement in wild life conditions in the state.

There are, of course, some wild life problems that are broader than state confines. Migrations of wild life create such problems. The migratory bird problem is the most notable of these. Its scope is not only nation-wide but international. Clearly, it could not be solved by each state working independently; it must be handled by the federal government. The Migratory Bird Law established a precedent for federal control, a precedent that many of the states were very loath to see established, although it was quite clear that the migratory bird problem could not be handled in any other way.

The precedent of federal control having been established there now follows, just as the opponents of the migratory bird bill feared, a growing tendency to enlarge federal control along other lines. The present session of the Congress has before it the Phipps-Colton Bear River Marsh Bill, the Hope Cheyenne Bottoms Bill, the Norbeck-Anthony Refuge Bill, the Jackson Hole Elk Hay-

lands Bill, and the Leavitt Northern Yellowstone Elk Bill. Besides, there is the Kaibab deer problem which has raised the issue of state versus federal ownership.

On the general proposition of state versus federal control of wild life I do not believe in federal control except in those rare instances, like the migratory bird problem, where conditions over a wide area embracing more than a single state are contributing factors to the problem, or where nation-wide interests are affected by it. I do not believe in the federal government taking control of wild life because the state administration is inefficient. When conditions become bad enough to arouse the right public sentiment reform will correct them, as it did in Pennsylvania and as it is doing in states like Wyoming and South Dakota.

The protection of wild life which remains in a local habitat or has a limited range of migration is purely a local proposition. The police power of the state is adequate, if efficiently organized, to handle practically all wild life control and it is best fitted to adjust control measures to the purely local conditions which exist in every state or in various parts of the state. It is closer to the people and can more readily secure popular coöperation, if it shows itself worthy of confidence, than a federal police agency can secure.

I do not believe the federal government should own or control the game in the national forests any more than the private owner of forest land within or adjacent to the national forest should have absolute control of the wild life on his premises. National forests which have no alienations may seem to furnish ideal situations for a perfect management of the wild life resource by the control of both the wild life and the cover, but none of the national forests are state-wide or constitute a distinct recognizable unit of wild life habitat within the state. Therefore, as soon as the federal government takes over the administration of a part of the wild life in the state there is created a dual control which will most surely lead to confusion and controversy that in the end will prove detrimental to the wild life and to the public interest.

When the time comes, and I believe it is coming, that all states have nonpartisan wild life administration with wild life experts in charge, when neighboring states will coöperate in uniform protective measures and the federal government will assist in the solution of nation-wide problems, then I believe we will have attained the best possible means of protecting and using our wild life resources.

WINTER GAME RANGE

By WALLACE J. PEARCE
Forest Supervisor, Washakie National Forest

THE enforced seasonal migration of some of the most important game animals in the West presents one of the most difficult aspects of game management. This migration, chiefly noticeable in the case of elk and mountain sheep and to a less extent in deer, is peculiarly a problem of the rugged Rocky Mountain chain, where differences in climate between summer and winter ranges are equivalent to a difference of many degrees of latitude. It seems well in passing to note that in other regions of North America, particularly in the eastern United States, the Lake States, and southern Canada, most of the large game animals have either adapted themselves to the use of areas year-long, or this has always been more or less their natural habit so that summer and winter ranges are largely synonymous. True, in unusually severe winters game will crowd in more around the settlements and cultivated areas, but on the whole there is not the outstanding migration so noticeable in the West.

As is quite generally known, and the Washakie National Forest and its environs are no exception, the most acute phase of the problem is winter range for the elk herds. This animal, because of its habit, when present in numbers, of congregating in large herds during the winter period, its rapid increase in numbers under a succession of favorable years, its easily cultivated taste for hay and cultivated grasses, quickly comes into conflict with developed agricultural regions, and especially so in the periodic severe winters.

The winter ranges of the Wind River elk herd are largely outside the national forest, the portion inside consisting of fringes along the boundaries, principally high, wind-swept, untimbered ridges. The ranges outside the forest are principally in private ownership, the portion in public ownership being so badly shredded up as to make administration for the benefit of game an extremely difficult matter. All these outside areas are intensively used by domestic stock. The valley bottoms are chiefly cultivated ranches, and the balance, whether privately owned or public domain, is used for spring and fall range for domestic stock, and in the case of the so-called " wild horses " some of it year-long. This latter class of stock is in sharp competition with the elk for winter range, since many of the horses run year-long on the ranges which the elk must use in the winter, and they also show a decided preference for the high wind-swept ridges within the forest. Fortunately, there seems to be an accelerating disposition to get rid of a large proportion of these worthless horses, so that this phase should show some improvement.

The winter ranges for which the elk show a preference consist of a rather narrow valley. While this valley widens out rapidly to the eastward, and there is no physical barrier to the elk migrating

a considerable distance into the lower country, they seem to prefer to hang to the areas close to their summer ranges. Accordingly, it appears that the number of elk must be restricted to what these upper winter ranges will support in severe years. That the providing of winter range for the Wind River elk herd is a problem has long been recognized, but nothing practical has been done toward solving it. Some years ago, when the amount of public domain was much larger than at present, it was recommended that the lands be withdrawn from entry and placed under the administration of the Biological Survey.

Even assuming that some such proposition should go through, the simple withdrawal of the lands would not solve the problem. Undoubtedly, if the elk are to receive any increased benefit from them, they must be fenced to exclude domestic stock. Further, because of intermingled private holdings, some of the lands in private ownership should be acquired. The longer the taking of some definite action is delayed the more complex will the problem become. Not only is land continually passing to private ownership, and eventually it may reasonably be expected that all of it will be so owned, but there undoubtedly will be an increase in the amount of domestic stock run in the country. The present numbers are only a small per cent of what have been run in the past, and while both forest and outside ranges were at one time unquestionably greatly overstocked, and numbers run in the future will never reach the old figures, yet the potential hay capacity of agricultural lands will take care of much more stock than at present in the country. Many of the old ranch properties are badly run down and these and other intermingled private lands could be acquired more cheaply now than at any other time past or future.

It has been pretty consistently admitted that summer range, under reasonable standards of stocking with domestic live stock, is not and will not be a problem. In the Wind River country it is clear that the summer ranges are more than adequate to take care of all that can be handled on winter ranges, under the most satisfactory handling of the latter that can be hoped for. The natural propensity of elk is to work back into the mountains just as early as possible, breaking through the scattered remaining drifts long before domestic stock reaches the ranges. Further, in the type of country within the Washakie, there are extensive areas to which game naturally migrates in the summer and which domestic stock never have and probably never will use. Moreover in a normal fall game remains on the ranges long after domestic stock has left, provided the areas have not been overstocked, and there is a reserve of forage left.

There can be little doubt that the presence of domestic stock is a disturbing factor to game, but our observations indicate that if there is plenty of feed the game will simply shift around to a given unit rather than leave it. In fact, any economic use of a forest is doubtless a disturbing factor temporarily.

It is interesting to note that the building up of the Wind River herd occurred during a period when both the forest and outside ranges were greatly overstocked. The evidence is quite clear that at one time the equivalent of four times the present numbers of domestic live stock were run in the upper Wind River country. While at present much of the range

is understocked, and the productivity of ranches has declined, advantage has been taken of the extinguishing of old forest preferences to reduce authorizations on the forest to what the ranges will safely carry. While it may be expected that in time the producing ranch property will be built up again, and the numbers of stock on the ranches increased, it appears certain that never again will there be the number of domestic stock in the country which marked the war years and the period prior thereto. With conservative stocking of forest ranges adhered to, summer range for the present numbers of elk is assured.

The principal group of mountain sheep summer on ranges not used by domestic live stock, and winter partly inside and partly outside the forest on Whiskey Mountain and the Jakey's Fork Canyon. Control of their winter range is largely a problem of the exclusion of grazing by horses.

There is no question that the numbers of elk in this region have reached a point where some measures must be taken to hold the herd at about its present numbers. It seems to me that the removal of local surplus in game should be secured through the process of hunting under the regular licenses, but hedged about with additional restrictions if necessary. I believe the number of hunters allowed in such a territory should be restricted, with preference possibly given to local residents, and applications approved supplementing the regular licenses, either in the order received or by lot, but without additional charge. Such supplemental permits might well specify the type of animal to be removed, restrict the hunting to a shorter season, and require a check in to the local game warden on entering and leaving the area, and such other stipulations as in the opinion of the Game Commission are desirable.

FUR FARMING

By FRED B. AGEE

Forest Supervisor, Bighorn National Forest

FUR is a valuable forest resource and, except for the wolf, coyote, and other predatory fur-bearing animals, it should be developed just as fully as other forest resources. In the national forests of the United States, I think the issue has been somewhat confused and progress hindered because of the dual control of fur-bearing resources, the federal government having ownership of the land and the state government ownership and disposition of the animals. Nevertheless, this does not alter the fact that fur-bearing animals constitute a valuable public resource, and that the public should reap the fullest benefit from it, whether through the federal government, the state government, or both.

In addition to the possibilities of building up increased numbers of fur-bearing animals through protection and transplanting to unstocked areas where food conditions are favorable, there appears to be a field for improvement in quality through the introduction of choice specimens and selective breeding. It is also logical to assume that selective breeding will make the greatest progress under the intensive conditions of handling on a fur farm; and this, perhaps, is one of the main benefits that would be derived from developing the fur-farming industry. This has been rather well demonstrated in connection with fox, in which there is a wide range in price between the best and poorest pelts; and fox farming in some regions, such as Alaska, has become a rather well established and profitable industry.

Except as to fox, however, little is known as to just how much improvement can be brought about in this way. With beaver, one of our most important fur-bearing animals, it is known the poorest quality of fur comes from the southern Rocky Mountain region, and the choicest from the Great Lakes; that the beaver pelts from the lower Rio Grande and Colorado Rivers bring only from $6 to $8, while choice furs from Michigan and Wisconsin quite often command as much as $50 each; but how much of this difference in quality is due to difference in sub-species of the animals and how much to climate and environment is not known. If choice specimens from the Lake States were introduced in the southern Rocky Mountain region, we do not know whether it would tend to improve the quality of the fur from that region, or whether the Lake States beaver would even survive in their changed environment. Without further research and experimentation, we do not know how much can be done to improve the quality of these animals either in their natural state or under fur-farming conditions.

Other than improving the quality of the fur through selective breeding, the possibilities of which (except for fox) are not definitely known, I cannot see where much public benefit would result through encouraging the development of private

fur farms in the administration of public forest lands. Studies made by the Biological Survey indicate that beaver farming can, under favorable conditions, be conducted as a private enterprise with profit to the individual. It has not, however, been demonstrated that a more rapid rate of increase can be obtained under farm conditions than in the wild state. Cultivated plants, when available, are used to some extent to supplement the natural food supply in beaver farming; but they draw principally upon the aspen and other natural foods, and it is, therefore, doubtful if beaver farming will bring about extension in numbers through increased food supplies. Unless there is improvement in quality or increased output of furs under farming conditions as compared with beaver in their wild state, the public would not have much to gain through encouraging private fur farming.

With beaver, perhaps the greatest disadvantage of all would be the fact that private beaver farming in our forests of the Rocky Mountain region would take into consideration only one thing, the value of the furs; while beaver in their natural state furnish a great many other benefits as a public resource. The storage of water in their dams furnishes increased supplies during the irrigation season; these dams in the mountain streams are excellent places for rearing fish; and in a minor degree they prevent erosion through better distribution of the stream flow.

In 1923, a rather careful survey was made of conditions in Silver Creek in the Cochetopa National Forest, near Salida, Colorado, in which stream it was estimated there were some 300 beaver occupying 46 ponds. A careful estimate was made of the acre-feet of water stored in each of these dams, which brought out the fact that the permanent storage value of these dams exceeded the estimated value of the pelts of the 300 beaver. It is true that this reserve supply was used by farmers during the short-water years; but as the West continues to settle and additional farms are developed, one can foresee the time when every available acre-foot of water will be keenly in demand. In Sheridan County, Wyoming, permanent rights for water furnished commercially from the Big Horn and Park reservoirs cost the farmers $40 per acre-foot of storage, and on most of the U. S. Reclamation projects the costs are still higher.

The value of the beaver dams in our mountains in fish propagation is well known, and will be touched upon only briefly here. Suffice to say that the deep pools not only furnish a suitable food supply, but also hiding places for the young fish where they can protect themselves from the larger ones. For this reason, they furnish excellent places for planting fish fry. It is also noticeable that the large fish caught from beaver dams are in excellent flesh, indicating favorable food conditions.

FISH PROPAGATION

By RAY PECK

Forest Supervisor, Grand Mesa National Forest

Nurse Ponds

HUNDREDS of dollars have been spent by the game clubs in western Colorado in acquiring useless retaining ponds. The usual procedure is as follows: A farmer living in the foothills informs the club officials that he has a small reservoir or ice pond on his ranch that would make an ideal retaining pond. The club officials tell him that a committee will be out to look it over. A committee is appointed and one or more members look over the proposition. They find a small reservoir, fed by a small stream, the dam of which is usually in bad condition. The farmer makes the committee a proposition to the effect that he will look after and feed the trout and the only expense to the club will be fixing up the dam, screening the outlets, and putting in a drain. This looks good to the committee so they report to the club that a dandy place has been found and the club agrees to foot the bills. The usual practice is to spend from $50 to $100 in fixing up the reservoir. Twenty to forty cans of trout are hauled to the place at the expense of the club. Some fish food is requisitioned from the state and sent to the farmer and the trout are left to his tender mercies.

In nine cases out of ten this is what happens: Much of the fish food goes to the farmer's chickens. The trout are fed irregularly, causing many to become cannibals and stunting others. Irrigation or flood waters go into the reservoirs, causing the screens to clog and washing the trout out into the meadows. Snakes, kingfishers, and herons prey on the fish after the inlet is shut off and used for irrigation purposes, and stale water kills the rest. If any are left the bottoms of the reservoirs are usually so rough and brushy that they cannot be captured when the pond is drained. The final result is that what few fish are raised to fingerling size cost the club around $30 per thousand. The farmer has his pond fixed up in good shape and usually enough fish left in it to give him a trout dinner once in a while. He tells his neighbors and others try to work out similar arrangements with the clubs. In three instances of this kind that have come to my personal attention it cost the game clubs $150 to save 4000 fish out of 40,000 and raise them to fingerling size.

Several men on the western slope who understand the game and make a business of raising young trout could have furnished the club fingerling trout when they wanted them at $5 per thousand. This all goes to show that raising young trout is a business in itself and should be handled only by experienced men who can give it the necessary time and attention.

Small lakes and ponds are often thought by forest officers to be good retaining ponds and at their suggestions game clubs have been induced to put large numbers of fish in places where

the natural food is entirely inadequate to support the numbers introduced, with the inevitable result that the trout live on each other.

My conclusion is, after watching the game for several years, tnat nursery ponds should be constructed only at state hatcheries where they can be watched by state men who are fully qualified for the work.

Planting Fish

Many thousands of young trout are wasted by stocking the same lake each year. This was fully demonstrated to me last season at Ward Lake on the Grand Mesa. I arrived at the lake about three hours after sixteen cans of brook trout were liberated from a boat landing that extended into the lake about 50 feet. These young trout were schooled in shallow water and had not scattered to any great extent. A school of trout from six to ten inches long was hiding under the boat landing and was continually darting out and seizing the bewildered fry. I venture to state that fully one-half of the fry were consumed the same day they were liberated.

Some of this loss could have been avoided, of course, if the fish had been properly scattered out around the lake shore when they were liberated, but it is a well-known fact that one and two-year-old trout are the ones that prey on the fry. The larger fish stay in the deep water and are not agile enough to catch the minnows. The evident solution of this problem is to restock lakes not oftener than every three years, and then stock heavily.

Closed Waters

Much good could be accomplished by closing lakes to fishing, especially after the first stocking, thus allowing the fish to attain a length of ten or eleven inches before being caught. In a group of lakes a rotation system should undoubtedly be adopted, certain lakes being closed and others opened each year. This would give the trout a better chance to reproduce, avoid the destruction of many undersized fish, and make for better fishing conditions all around. Certain streams or sections of streams should likewise be closed at intervals to allow fish to reproduce. The streams are always open to fishing during the time trout are spawning and very little natural reproduction is possible under these conditions, since practically all the streams of Colorado open to the public are now extensively fished.

Much opposition can be expected, however, from resort owners when a closing policy is advocated on either a stream or lake they are using in their business. When a policy of that kind was advocated for the Grand Mesa Lakes every one up there thought it would be fine but each wanted to close a lake that the other fellow had his resort or summer home near. Certain communities would take the same attitude unless there were enough waters to supply the demand without the closed waters.

Some of the best streams in the state, such as the Gunnison and the White River, are now extensively closed to public fishing, yet the money derived from fishing licenses is being used indirectly, at least, to stock these streams. It could be said, therefore, that many

resorts on posted waters are now being financed with public funds.

Sawdust

On Grizzly Creek in North Park, at the site of the old Bennett sawmill, I once caught several nice trout from a hole in the stream that had been washed out in the sawdust pile. This pile of sawdust was very large and the creek ran through it for a distance of about one hundred feet. Much of it had been washed away and sawdust lined the shore of the stream for several hundred yards below the set. This old dust did not seem to hurt the trout in the least, and I believe that only sawdust fresh from the saw is injurious.

SOME RESULTS OF THINNING JACK PINE[1]

By T. S. HANSEN and R. M. BROWN
Division of Forestry, University of Minnesota

VERY dense stands of jack pine are common throughout the range of this species in the Lake States. Most of these stands have come in after fires and clear cutting, and are so dense that stagnation occurs at a comparatively early age. By *a priori* reasoning, thinnings should increase the growth of jack pine.

In recent years jack pine has increased tremendously in commercial importance. On the Cloquet Forest Experiment Station this species, in less than fifteen years, has increased from an almost negative stumpage value to a present value that cannot be ignored. Jack pine will always be present on the light, dry, sandy soils in the Lake States and therefore will play an important part in the management of this soil type for the production of wood crops.

Jack Pine Thinning Experiments at Cloquet

The importance of definite information on the results of thinnings of jack pine stands was early recognized by the foresters at Cloquet where this species, because of its abundance, plays an important part in the management of the area. In 1912-1914[2] a half-acre thinning plot was established in a 37-year-old stand of jack pine. The boundaries were carefully laid out and all the trees on the plot were tagged and the diameters measured in two directions with calipers. The height of each tree was determined by a hand hypsometer. Unfortunately a satisfactory check plot was not established at the same time. Forty trees were tagged and measured as a check, but were later found to be unsatisfactory for this purpose.

Site Factors

The stand is growing on a fairly deep, dry, fine, yellow sand classed as Omega sand by the Soils Division of the University of Minnesota. The ground cover consists chiefly of blueberry, wintergreen, sweet fern, trailing arbutus, and other herbaceous plants common in this type. At the time of thinning very little or no reproduction of jack pine was present in the stand. Underbrush was practically absent except for an occasional hazel bush. The topography of the region is flat to gently rolling. The water table, judging by the swamps in the vicinity, is relatively near the surface. The growing season covers a period of about four months from May 1 to August 31. The average annual rainfall, taken from records at the Station, is between 25 and 30 inches, and for the months of May, June, July, and August averages approximately 14 inches. The mean temperature for the growing season is 55° F. Killing frosts may occur during any month of the year, but usually not later

[1] Published with the approval of the Director as Paper No. 190 of the Miscellaneous Series of the Minnesota Agricultural Experiment Station.

[2] The plot was laid out in 1912 and measurements completed in 1914. For the purpose of this paper, 1913 was taken as the year of establishment.

than June 15, nor earlier than September 15. The winters are long and severe with much snow. The minimum temperature on record is 45° F. below zero.

Site Classification

The stand is growing on a site that will produce an average dominant tree of 53 feet in 50 years, according to the unpublished yield tables for this species compiled by the Lake States Forest Experiment Station.[3] This corresponds to the average site index of the stands measured throughout the Lake States, but is 9 per cent below the average site index of the stands measured in Minnesota. This area may therefore be taken as representative of the average site conditions for this species in the Lake States and slightly below the average for Minnesota.

Density of the Stand

Before thinning there were 590 trees to the acre with a stand basal area of 142 square feet. Compared with the average well-stocked stand of the normal yield table, the stand was 40 per cent understocked by number of trees and 21 per cent overstocked by stand basal area.[4] This stand would be considered normal by the standards used in rejecting abnormal stands when the yield table was compiled. This degree of stocking may account in part for the negative results of the thinning.

Degree of Thinning

The thinning was chiefly from below, removing mostly suppressed, intermediate, and a few codominant trees. The trees were cut into pulp sticks and piled in cords. Of the total volume per acre of 26.4 cords, 29 per cent, or 7.6 cords, were removed in thinning. On an acre basis, 232 trees, or 39 per cent of the total number, were removed, an equivalent of 30 per cent of the stand basal area. The thinning reduced the density to 37 per cent of the normal number of trees and 84 per cent of the normal stand basal area. This degree of thinning should have allowed ample space for the growth of the remaining trees.

Results of Thinning

As indicated in Table 1, the total net increase in cubic volume for the period as a result of losses and growth is 90 cubic feet (about one standard cord), or 7 per cent. This is equivalent to a periodic annual growth of 10 cubic feet. The stand increased 500 board feet during the period, an increase of 25 per cent over the original volume. The stand basal area remained stationery and the change in average diameter was not appreciable. During the period 46 trees per acre died from natural causes. Unfortunately these figures can not be compared with per acre figures from a check plot.

Diameter Growth After Thinning

Acceleration of diameter growth is one of the chief results expected when a stand is thinned. In order to minimize the experimental error from such sources as instrumental errors and incomparable check plots, 10 trees in each diameter class were bored in 1927 for the purpose of studying the breast high diameter growth of the same trees before and after thinning. The diameter growth for the

[3] By R. M. Brown and S. Gevorkiantz from data collected by A. E. Wackerman.

[4] Assuming that the stands used as a basis for these tables were not overstocked.

TABLE 1

RESULTS OF THINNING IN A 37-YEAR-OLD STAND OF JACK PINE, CLOQUET, MINNESOTA

Year	Trees per acre	Average D. B. H.	Stand basal area per acre	Volume per acre	
				Trees 2″ and up [5]	Trees 8″ and up [6]
	Number	*Inches*	*Sq. ft.*	*Cu. ft.*	*Bd. ft.*
1913 [7]	358	7.3	98	1260	1500
1922	312	7.6	98	1350	2000

[5] Total stem wood.
[6] Scribner Decimal C rule, Top D. I. B., 5.5 inches.
[7] After thinning.

TABLE 2

PERIODIC DIAMETER GROWTH INSIDE OF BARK AT BREAST HEIGHT BY DIAMETER CLASSES IN A THINNED STAND OF JACK PINE, CLOQUET, MINNESOTA. FIGURES NOT CURVED

D. B. H.	Periodic diameter growth				Number of borings
	Before thinning	After thinning			
1927	1908-12	1913-17	1918-22	1923-27	
	Inches				
Inches					
6.2	.22	.18	.14	.17	10
7.1	.25	.27	.20	.26	10
8.0	.30	.28	.23	.38	10
9.0	.33	.29	.24	.30	12
9.9	.38	.37	.32	.38	10
8.1	.30	.28	.23	.30	52

TABLE 3

PERIODIC BASAL AREA GROWTH INSIDE OF BARK AT BREAST HEIGHT BY DIAMETER CLASSES IN A THINNED STAND OF JACK PINE, CLOQUET, MINNESOTA

D. B. H.	Periodic basal area growth				Number of borings
	Before thinning	After thinning			
1927	1908-12	1913-17	1918-22	1923-27	
	Square feet				
Inches					
6.2	.013	.011	.009	.011	10
7.1	.017	.020	.015	.020	10
8.0	.022	.022	.020	.032	10
9.0	.029	.027	.023	.031	12
9.9	.037	.038	.034	.041	10
8.1	.023	.023	.020	.027	52

five-year period previous to thinning and at five-year intervals thereafter was measured on these cores. Tables 2 and 3 show the periodic diameter and basal area growth by diameter classes and five-year periods.

These figures clearly show that the stand did not respond to the thinning. The writers advance the following hypotheses for this:

1. Jack pine is a very intolerant tree which matures at a relatively early age. The crown recedes very rapidly up the stem and very little lateral growth of the branches remaining takes place. This reduces the effective photosynthetic leaf area, and although additional growing space is made available by thinning, the crown is reduced below the minimum necessary to completely utilize the added space.

2. The original stand as compared with the fully stocked stand of the normal yield table was 40 per cent understocked by number of trees and 21 per cent overstocked by stand basal area. The large stand basal area may indicate that each tree had ample room for development, *i. e.*, for the given effective photosynthetic leaf area the trees before thinning were fully utilizing the site factors. If this were true, of course no response could be expected.

3. The thinning was chiefly in the poorer crown classes.

4. Reduced rainfall for the period 1918-22 may be a factor.

Retarded Diameter Growth

Instead of an increase in diameter growth, the figures show an apparent retardation, especially during the period from 1918-22. The average growth in diameter for the last five-year period from 1923-27 was the same as for the period immediately preceding thinning. Can the differences shown in the tables be considered as indicative of true differences in the average diameter growth, or mere chance fluctuations of sampling? If there is a real retardation, is it due to disturbing the natural balance of site factors by thinning?

Statistically, these data show that a difference of less than .045 [8] inches in the average values of the diameter growth for a five-year period can be expected in both the thinned and unthinned stand as a result of chance fluctuations of sampling, that is, if additional measurements were taken in the same stand the average value of the diameter growth might vary from the above figures by that amount. This would indicate that the difference of .07 inches in the average diameter growth for the period 1918-22 borders on a true difference and therefore due to factors other than chance fluctuations in the samples. The fact that the growth in all diameter classes was retarded is also a good indication that this difference is real. An analysis of a few borings taken in an unthinned jack pine stand in the vicinity also shows a decrease in diameter growth for 1918-22. Evidently it is not an effect of thinning, but the result of some blanket cause affecting both the thinned and unthinned stands alike.

As moisture available during the growing period is no doubt one of the chief factors limiting growth in these dry situations, the writers turned to rainfall as a possible answer. The average rainfall

[8] Three times the standard deviation of the difference.

during May, June, July, and August was obtained from records taken within one-quarter of a mile of this stand. A comparison between this rainfall and the diameter and basal area growth at breast height is given in Table 4.

TABLE 4

COMPARISON BETWEEN RAINFALL AND GROWTH IN A THINNED STAND OF JACK PINE, CLOQUET, MINNESOTA

Period	Average rainfall, May 1 to Aug. 31	Growth inside bark at breast height	
		Diameter	Basal area
Years	*Inches*	*Inches*	*Sq. ft.*
1913-17...	14.4	.28	.022
1918-22...	12.6	.23	.019
1923-27...	14.2	.30	.026

The data in this table indicate a concomitant variation in rainfall and growth. Growth in both diameter and basal area falls off with a decrease in rainfall during the 1918-22 period, and increases with an increase in rainfall in the following five-year period. Although no cause and effect conclusions between rainfall and growth can be definitely established from these data they may furnish a clue for further fundamental investigations.

CONCLUSIONS

1. Increased growth in jack pine stands thinned after they are 40 years old is problematical.[9]

2. Complete knowledge on the relative density of a stand and the growing space required for the best development of each tree is necessary before it can be intelligently thinned.

3. Reliable and complete information on what, when, and how to thin can only be obtained by:

   a. Increasing the number of sample plots thinned.
   b. Thinning stands of different ages.
   c. Varying the grade or degree of thinning.
   d. Varying the kind of thinning.

4. Where possible, complete local weather records should be kept for areas where permanent plots have been laid out.

[9] Investigations are now under way to determine the effect of thinning dense young stands.

A MORE SCIENTIFIC METHOD OF EXPERIMENTAL THINNINGS

By F. I. RIGHTER

Junior Forester, Southern Forest Experiment Station

THE method now in vogue of conducting and evaluating thinning experiments is considered by the writer to be inadequate because it obscures obtainable knowledge which would greatly enrich the science and contribute to the completeness of the results obtained.

Thinning experiments, as they are commonly conducted, can be expected to yield information which will make possible an evaluation of the results of thinning the prototype of a stand which is not thinned. Such an operation does not constitute an experiment in the real meaning of the word because it violates a principle of scientific experimentation. It is customary in scientific experimentation either to subject similar things to different treatments, or dissimilar things to the same treatment. A thinning experiment does neither. It must be obvious that when a plot is thinned its nature is changed, and the unthinned plot cannot be a check because it is no longer like the treated plot. Thinning automatically affects the average height and average diameter figures, and consequently no adequate comparison of the growth on the thinned and unthinned plots can be made. In other words the present practice is to compare the results of subjecting unlike stands to different treatments.

It has been customary for investigators to compute the periodic growth or yield per cent of the plots and to use the results for purposes of comparison, evaluation, and presentation. Periodic growth or yield per cent usually is based on the volume of the stand after thinning. But the check plot receives no thinning; so its growth per cent must be based on its original volume and then compared to the growth per cent of a plot having a smaller original volume depending on the degree of thinning it receives at the beginning of the experiment. This throws the basis of comparison completely out of proportion, and results in figures which may be very misleading. The thinned plot may, and usually does, show a higher periodic growth per cent but a lower total cubic foot volume growth than the check plot.

A satisfactory comparison of the total volume production of the check plot with that of the thinned plot is impossible without frequent measurements of every tree on each plot, because each plot must be credited with the growth that has already taken place on the trees which die. Such intensive supervision may be beyond the reach of many investigators. It would simplify matters if a reliable comparison of the growth on treated and check plots could be made without the necessity of keeping an elaborate mortality record. It is obvious that the present method of conducting thinning experiments leaves much to be desired even in this respect.

It therefore seems logical to suggest that a provision for theoretically treating the check plot just as the other plots are treated be included in thinning experimentation practice. This can be accomplished by marking the check plot for thinning (of course without actually making the thinning) when and as the other plots are marked. This can be done regardless of whether one or several methods and degrees of thinning are to be included in the experiment. This operation will leave unmarked the stand on the check plot which corresponds to the residual stand on the plot to be thinned. This stand should then be marked permanently so that its development, growth, yield, etc., can be compared to that of the thinned plot at any time in the future. This will enable the investigator to regard the thinned plot as the check and the unthinned plot as the treated one.

Theoretically, such an experiment is sounder than the customary tests because it conforms to a scientific requirement in that it subjects similar stands to different treatments.

The incorporation of this operation into thinning experiments will enable investigators to kill at least two birds with one stone at but a small increase in cost. It will enable them to carry on as before, and, in addition, they can conduct an experiment within an experiment. It will yield information which can be obtained in no other way. The acceleration of growth of a stand after a thinning can be studied to better effect by having a similar unthinned stand to serve as a check. The mechanical alteration of average height and diameter figures which results when a stand is thinned will have no significance because, theoretically, each stand will be thinned in the same way. It will not be necessary to keep an elaborate mortality record because, unless otherwise specified, the main interest will be in the two similar stands. Only the stand on the thinned plot and the trees to be compared with it on the unthinned plot will require recording, and such recording need not be done annually. All the trees designated for the theoretical cutting on the unthinned plot may grow and die without notice and not affect the comparison of the stands in question regarding growth or yield. In such an experiment growth per cent and periodic growth per cent figures will not be misleading because the figures for each plot will be based on equal or nearly equal volumes at the beginning.

It is extremely probable that additional desirable qualities will be found to inhere in the method just described. At least it is presented as a suggestion well worthy of trial.

SOME COMMENTS ON METHODS OF PRESENTING DATA IN YIELD TABLES

By E. J. HANZLIK

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Introduction

I HAVE had on my desk for several days now the following recent reports by research men regarding yield studies of western species: "Yield Capacities of the Pure Yellow Pine Type on the East Slope of the Sierra Nevada Mountains in California," by S. B. Show, Journal of Agricultural Research, Vol. 31, No. 12, December 15, 1925; "Preliminary Normal Yield Tables for Second-Growth Western Yellow Pine in Northern Idaho and Adjacent Areas," by C. Edward Behre, Journal of Agricultural Research, Vol. 37, No. 7, October 1, 1928; "Yield, Stand and Volume Tables for Red Fir in California," by F. X. Schumacher, Bull. 456, Univ. of Calif. Agri. Exp. Sta., August, 1928; and a manuscript report, "The Growth of Douglas Fir in Western Washington and Oregon," by R. E. McArdle, to be published as a Department of Agriculture bulletin.

Primarily, these four reports deal with normal yields of species, two on western yellow pine, one on Douglas fir, and one on red fir. It is especially desirable in yield tables that essential data, such as site index, diameters, board-foot volumes, heights, etc., be presented so that ready comparison for different site qualities with the same species may be had, while it is always of value to be able to compare directly values for competing species in the same region, or even in different regions. Using this as a criterion of the value of these four reports, a thorough reading and a considerable amount of study convince me that the principal object, namely to present facts in a readily usable form to the administrative and techincal man, has not been accomplished.

Form of Yield Tables

What has become of the old reliable standard form of yield tables as taught in Graves' "Forest Mensuration," modified from the standard form used by European foresters? Here were presented the essential data by site quality classes, each one complete in itself, showing data for all trees in the stand on the left-hand side, and adjoining on the right data for the merchantable portion. This form was easily understood and readily used by either the administrator or technician. Nothing, in my mind, has been devised to improve upon this form and it surely would be of advantage to adopt it as a standard again.

Of the four yield tables under consideration, only Show's report presents the yield data after this fashion, with, however, some of the essential data lacking, such as figures pertaining to trees in the merchantable class as compared to those for all trees in the stand. The need of such a presentation is recognized even by research men, as is evidenced in a report by W. H. Meyer on application of yields where he rearranges McArdle's yield data on Douglas fir in this fashion.[1]

[1] Ms. report, "Predicting Yields of Average Stands of Douglas Fir," by Walter H. Meyer, Pacific Northwest Forest Experiment Station, Portland, Oregon, 1928.

Two of the other reports (McArdle's and Behre's) use methods of presenting the data in separate tables for each class of data for all site indices. Schumacher follows somewhat the old form by combining data for each site index into two tables, one for all the trees and another for trees in the merchantable class.

Of these four reports, only one (McArdle's) includes a complete line of data as considered essential by foresters in management work, while the others are only partially complete in this respect.

Site Index Standards

There is an inconsistency in the age upon which the site indices are based, Behre and McArdle using 100 years, and Schumacher 50 years. Show's report, being prepared some years previous, uses site quality based upon heights of mature timber and should not be considered at fault in this respect. There appears to be no reason why 50 years should be chosen for western species because of their extreme height and the greater variation, no doubt, in the heights at the younger age. I should like to recommend that the 100-year standard for site indices be maintained in preference to 50 years.

Board-Foot Volumes

Log scale for second-growth stands has not yet been standardized, although only Behre's tables show merchantable volumes according to the International $\frac{1}{4}$-Inch Rule. The other three use the International $\frac{1}{8}$-Inch Rule, which appears to be best suited to show actual sawn merchantable contents obtainable from small, sound, standing timber. There is also a lot to commend in McArdle's giving board-foot contents according to the Scribner Rule. This leads to greater ease of comprehension by the average forester who is used to thinking in terms of present-day log scale and timber volume. This practice of showing volumes by the International $\frac{1}{8}$-Inch Rule and the Scribner Rule should be universal in yield table construction.

Standards for computing merchantable contents appear to vary according to the whim of the author, the director of the experiment station, or the reviewer. For volumes by the Scribner Rule, a standard appears to be quite well set, namely to a 12-inch-class minimum in diameter breast high and to a top diameter inside bark of 7 or 8 inches. Tree sizes by the International Rule are quite varied however. McArdle uses two standards in his report—(1) trees in the 12-inch diameter class and larger to a 5-inch top, and (2) trees in the 7-inch diameter class and larger, also to a 5-inch top. Schumacher in his red fir tables computes board-foot volumes for trees in the 8-inch diameter class and larger to a 5-inch top; Behre for 8-inch trees and up to a 4-inch top; and Show for 8-inch trees and up to a 5-inch top. In this respect, the 8-inch diameter class is used by three and the 7-inch class by one; while the 5-inch top is used by three and the 4-inch top by one. From this, it appears that a standard for the International $\frac{1}{8}$-Inch Rule could be set at the 8-inch diameter class and larger to a top diameter of 5 inches inside bark. Optional tables could be prepared, as by McArdle, to a larger diameter class as a minimum, preferably 12-inch, so as to afford a direct comparison with volumes by the Scribner Rule.

Average Heights versus Dominant and Codominant Heights

For practical purposes in the field in judging site qualities and site indices,

there is no doubt that tables giving dominant and codominant heights upon age are of the greatest value. Average heights are not used in judging growth capacities and appear to be of practically no value for any other purpose to the field man. All four reports give the heights of dominants, McArdle and Show in the body of the yield tables; Behre and Schumacher as separate curves, while in the tables themselves they give the heights of the average trees. McArdle uses for his site indices the dominant and codominant trees; the three other reports use only the dominants.

Number of Trees Per Acre

For administrative and other purposes, it is very desirable to have data on the number of trees per acre, sometimes for all the trees in the stand and sometimes for those in the merchantable board-foot class. McArdle and Schumacher give both classes of data; Behre gives only the total number; Show's tables are not definite, but it is inferred that total number is meant.

In this respect the minimum diameter considered in the total number of tree classes varies. Behre takes his down to 3 inches at breast height; McArdle's report does not state this as far as I can find, but from past work on Douglas fir it is my impression that all trees to 2 inches are included; Show's tables are for trees 4 inches and larger; while Schumacher, with red fir, considers all trees that have reached breast height (4.5 feet) in this class. These variations in the minimum diameter sizes cause some differences in basal areas and cubic volumes, but not nearly so much as in total number of trees.

Information as to total number of trees is surely important enough to warrant the adoption of some standard which is capable of application to all species. No doubt one to a 2-inch or 3-inch diameter class, outside bark, at breast height, would be satisfactory.

Number of trees in the merchantable timber, given only by McArdle and Schumacher, should be shown by all means, and should be for the same diameter classes as used in computing the merchantable board-foot volume. If different standards of merchantability are used, as by McArdle, in computing board-foot volumes for both Scribner and International rules, the respective number of trees for each should be given.

Average Diameters

As with number of trees, it is very desirable to know the average diameters of all trees and of trees in the merchantable board-foot class. If several standards of merchantability are used, the average diameter for each should be given. All four of the reports give average diameters of all trees in the stand (with lower diameter limits varied as discussed under "Number of Trees"), while only McArdle gives in addition average diameters on age of trees in the merchantable board-foot class. There is a slight difference in the method of obtaining average or mean diameters, Schumacher differing by averaging diameters of trees instead of following the usual method of taking the diameter of the tree corresponding to the average basal area, as done by McArdle, Behre, and possibly Show. From the standpoint of the field man, Schumacher's method is no doubt most easily used and understood, and could be very well adopted for obtaining average diameters for both classes, *i. e.*, all trees and trees in the merchantable board-foot class.

Summary

Summing up the situation, there is considerable variation in the presentation of yield data, with no set standards as to form of table, site indices, board-foot log rules, heights of trees, number of trees, and average diameters.

In order to arrive at some set standards readily applicable to second-growth stands, the accompanying form is presented for discussion by research men and others as well fitted to suit all conditions. It is hoped that some such standards will be adopted so that the administrator or technician will not have to read through a whole report, dig out essential data from the text, and then perhaps have to recompute certain portions, or make assumptions, in order to give him figures which he requires in his timber management work.

Addenda

Since writing the foregoing, two other reports on yield studies have come to my mind—one by Bruce, "Preliminary Yield Tables for Second-Growth Redwood," Bull. 361, Univ. of Calif. Agric. Exp. Sta., May, 1923, and another by Schumacher, "Yield, Stand, and Volume Tables for White Fir in the California Pine Region," Bull. 407, Univ. of Calif. Agric. Exp. Sta.

Bruce follows somewhat the form suggested in this paper, with, however, some differences. Combining the data for each site quality is a great help over the scattered method employed by Behre and McArdle, and his use of the Clark International $\frac{1}{8}$-Inch Rule for board-foot contents is very good. Giving average diameters and basal areas of dominant and codominant trees appears to be of no advantage, unless the trees of these classes compose practically the entire stand considered merchantable. Trees considered merchantable were taken to a 5-inch diameter in the tops, inside bark, and although not stated, it is my impression that a 7-inch minimum diameter breast height was used. No data are given for values by the Scribner Rule, these not being considered necessary for redwood, since practically no second-growth stands are being cut.

Schumacher's tables for white fir are somewhat in the same form as his red fir tables (discussed previously). He uses the 50-year site index, and cubic volume, basal area, number of trees, etc., are based upon trees 4 inches and over. Board-foot volumes are by the International $\frac{1}{8}$-Inch Rule (read the text to find out) for trees 8 inches and over to a top diameter inside bark of 5 inches. The tables give average heights, while a set of curves gives heights of dominants at various ages. One advantage of Schumacher's tables is that data for each site index are listed in one table, although two sets of figures are prepared for each site index, one for all trees (trees 4 inches and up), and another for trees 8 inches and up giving board-foot contents.

In conclusion, the great differences in the forms of yield table data in reports since 1923 indicate that a standard form is very desirable, and use by administrative men and others brings out that the tables in the later reports, such as Behre's on yellow pine in Idaho, and McArdle's on Douglas fir, are not as acceptable and capable of rapid use as those in the form where all data for each site index or site quality are presented in one tabulation as a unit. Usually, any one working with yield data is interested in one site quality at a time, and the practice of separating site qualities by number of trees, volumes, etc., does not lead to ease or accuracy in using the data.

NORMAL YIELD TABLE FOR SECOND-GROWTH DOUGLAS FIR, WESTERN WASHINGTON AND OREGON

(Sample table)

SITE INDEX 140 (SITE QUALITY III)

Total age, years	Av. total height, dom. and codom. trees, feet	Trees 1.6" d. b. h. and larger per acre							Trees 7.6" d. b. h. and larger per acre								Trees 11.6" d. b. h. and larger per acre									
		Number of trees	Av. d. b. h., inches	Height of av. tree, feet	Basal area, square feet	Vol. in cubic feet[1]	Mean ann. growth, cubic feet	Periodic ann. growth, cubic feet	Number of trees	Av. d. b. h., inches	Height of av. tree, feet	Basal area, square feet	Vol. in cubic feet[1]	Mean ann. growth, cubic feet	Periodic ann. growth, cubic feet	Vol. bd. ft., Int. ¼-Inch Rule[2]	Mean ann. growth, Int. ¼-Inch Rule	Periodic ann. growth, Int. ¼-Inch Rule	Number of trees	Av. d. b. h., inches	Height of av. tree, feet	Basal area, square feet	Vol. in cubic feet[1]	Mean ann. growth, cubic feet	Periodic ann. growth, cubic feet	Vol. bd. ft., Int. ¼-Inch Rule[2]	Mean ann. growth, Int. ¼-Inch Rule	Periodic ann. growth, Int. ¼-Inch Rule	Vol. bd. ft. Scribner Rule[3]	Mean ann. growth, Scribner Rule	Periodic ann. growth, Scribner Rule
10																													
20																													
30																													
40																													
50																													
60																													
70																													
80																													
90																													
etc.																													

[1] Total solid contents of entire stem, including stump.
[2] Contents of trees, log scale, in board feet to 5 in. top, d. i. b.
[3] Contents of trees, log scale, in board feet to 8 in. top, d. i. b.

REVIEWS

Deforested America. By Major George P. Ahern, Washington, D. C., 1928. *79 pp.*

In this publication, with an introduction by Gifford Pinchot, Major Ahern has brought together the results of his own observations coördinated with the material secured by many investigators in all parts of the United States. This material is so voluminous as to defy concentration. Suffice it to say that no recent publication brings so much authentic detail regarding forest conditions throughout the United States into such small space. For these details the interested reader is advised to secure a copy of the publication for himself.

The material is grouped in three chapters. The first of these summarizes our forest situation nationally and regionally. The second deals with industrial forestry, with a summary and detailed reports from all parts of the country. It is clear from these reports that on only a small proportion of the privately owned forests has even a beginning toward sustained yield been made. The third chapter is a general summary.

The reviewer assumes that the average forester who may read this review has already familiarized himself with the bulk of these facts, viz., that approximately one-eighth of the original virgin forests now remain uncut, that the growth is about one-fourth the cut, etc. It may still come as a shock to some to learn that even in the great Northwestern Forest Region the privately owned forests will for the most part be cut over, at the present rate, in less than twenty years.

These facts show that we have ahead of us a compulsory reduction in consumption of forest products, principally lumber. It is now too late to prevent this. There is still time to begin rebuilding the forests so that the period of privation will be short. The central problem raised by Major Ahern's report is how to get immediate action. This brings up the question which agitated the Society several years ago, viz., voluntary action versus government compulsion. Major Ahern correctly summarizes the attitude of foresters since that time as one of interested spectators securing and reporting the facts but doing almost nothing about them. They have been unable or unwilling to assume leadership in corrective measures.

The reviewer believes that so far as private forest industry is concerned it is in the grip of those apparently irresistible economic forces, common where individual initative has free reign, whirling it onward through a mostly profitless career to destruction of its foundation resources and industrial superstructure alike. Stumpage prices and costs will rise, but profit margins will be nonexistent, except for the few lowest cost producers. The most fundamental reason for this is that a highly competi-

tive industry, wasteful in its operations and distributing methods, cannot possibly maintain a price level which will pay costs, including the complete liquidation of its mills, transportation facilities, and natural resources, in the days of grace Major Ahern's report clearly shows remain to the industry before its virtual end in the privately owned forests. Participants in the industry are victims of an industrial system which, though lavishly productive for today in timber, oil, coal, and other products of our natural resources, has little place in its calculations for our hoped-for long national future. Unless the problem of natural resource perpetuation is quickly solved our mechanized prosperity is only a destructive prelude to a pinched and drab national existence where a lack of essential raw materials will prohibit effective operation of our otherwise magnificent industrial plant.

We know now that unrestrained free initiative, however productive in commodities, will not preserve our resources in production. There remain only three methods of attack: voluntary coöperation within the industry; compulsion by government authority; or socialized production from publicly owned forests. In all probability neither public opinion nor the economic situation within the industry leaves over five years more for the industry to adopt the first choice. If it does not solve the problem in a reasonable way there will be effort to solve through compulsion and through further publicly owned forests. Grave consequences may flow from either, since other industries are very similarly situated. A fundamental change in the handling of all natural resources will necessarily result.

While these questions are being decided let us hope there will remain a few free souls economically independent of private or governmental subsidy who will keep before our profession, forest industry, and the public, the fundamental fact that only a sustained yield production policy will reduce competition to that sane basis which will alike preserve the forests, conserve the capital investments, and insure reasonable industrial profits. Only this system, or its counterpart, applied to other national resources and forests alike, can preserve the magnificent national estate with which nature has endowed us.

BURT P. KIRKLAND.

Climatic Cycles and Tree Growth, Vol. II. A Study of Annual Rings of Trees in Relation to Climate and Solar Activity. By A. E. Douglass. *Carnegie Institution of Washington, 1928.*

Douglass' investigations of tree rings in relation to cycles of rainfall are well known to most foresters because of the promise they hold as a means of long range weather forecasting. The present volume is the most recent of a series of publications on the same subject since 1909. Early investigations pointed to more or less definite cycles in the occurrence of wide and narrow growth rings, and these cycles were found to correspond with precipation, as far as weather records were available. Assuming such periodicity and correlation, it should be possible theoretically to read past climatic history in the record of tree rings and also, by projecting established cycles into the future, to predict the coming of wet

and dry periods. The present work, based upon a greatly increased volume of tree material collected over a wide range of territory, tends to corroborate and amplify the earlier conclusions.

The author describes in considerable detail methods of collecting material and technique of measuring, recording, and analyzing tree rings. Due consideration is given to the many factors other than climate which may affect the width of annual rings. Competition, disease, insect injury, fire, and other agencies which retard growth temporarily must be taken into account. To a certain extent this is done automatically through the selection of large and very old trees which, in order to attain their size and age, must have been dominants and relatively free from disturbing influences. Two instruments called the "plotting micrometer" and the "longitudinal plotter" transfer the ring records to a strip of paper on a magnified scale in order to facilitate accurate measurement and analysis. A third instrument called the "cyclograph" is employed to detect periodicity in the occurrence of maxima in graphs of annual diameter growth plotted as ordinates on years as abscissæ.

Radical sections of western yellow pine from ten western mountain states were studied. Individual trees in a given locality were found to agree closely in periodicity, but in comparing trees of different regions there was often a lack of agreement. By comparison of smoothed curves, three western centers appear: Pikes Peak, Flagstaff, and Sierra Nevada. In the regions represented by each of these centers, the curves are homogeneous and at points between the centers mixed effects are obtained. Cycles of 11 and 14 years dominate on the Coast, 14 and 21 years in Arizona, and 10 and 11 (or 23) in the Rocky Mountains.

The Flagstaff tree record extending from 1300 to 1925 is regarded as the best of the series as a history of rainfall. In addition to the 14 and 21 year cycles, it also shows an 11.3 year cycle which corresponds to the known sunspot record. This cycle was interrupted from 1630 to 1850. It also appears, with interruptions, in the Sequoia record extending back to 300 B. C. Flagstaff trees also show a 7 and 9.4 year cycle during portions of the 600 year period. Growth maxima and presumably rainfall maxima occur during sunspot minima. Measurements of solar radiation show an average of about 3 per cent above normal during sunspot maxima. The dry years in the Flagstaff record analyze best on 14 and 21 year cycles, with major droughts at about 150 year intervals and minor droughts at 40 or 50 year intervals. The extension of cycles observed in the past 200 years in the Flagstaff area indicates possible large growth of trees in the 1930's and 1950's, with depressions in the early and late 1940's.

To those whose interest in this investigation is centered in its practical aspects, it should be explained that much remains to be learned about climatic cycles before the desired application becomes possible. If, as many have assumed without full information, the precipitation curve rises and falls in regular waves, all would be simple. But the curve is far from regular. Instead of a single cycle operating uniformly through centuries, there are cycles of 7, 9, 11, 14, and 21 years, each apparently

working with varying intensity. Sometimes two or more cycles coincide with exaggerated effect, and again they may neutralize each other, wholly or in part. In order to employ cycles in long range forecasting, more must be learned about the causes behind each cycle. The problem is exceedingly complex, but it is not hopeless when one looks upon the past achievements of astronomical science.

G. A. Pearson.

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Plant Autographs and their Revelations. By Sir Gagadis Chunder Bose, Director, Bose Institute, Calcutta. *The Macmillan Co., New York, 1927. Pp. xvi+240, 120 figs.*

Bose gives a popular account of the researches that have been carried out at the Bose Institute on the behavior and responses of plants to various stimuli. The author sets out to prove the main thesis that the life processes and activities of plants are fundamentally similar to animals although at first sight they appear very different. The author contends that there is no life-reaction in even the highest animal which has not been foreshadowed in the life of plants.

Bose has performed many ingenious experiments and resorted to unique and in some cases weird devices to get at the silent life of plants, how they grow, and how they react to various shocks and stimulants. His explorations have taken him into the border field between plant physiology and physics. By means of electrical apparatus, automatic recorders, and many physical appliances he has succeeded in obtaining charted records of plant movements, growth, reactions to various stimulants and depressants, both physical and chemical, and even death. In most cases the movements and reactions were amplified many thousand times to make them perceptible.

Bose's descriptions of his experiments are extremely interesting and make entertaining reading for the layman and scientist alike. Foresters, especially those engaged in research, will be interested in his chapters on growth, the influence of light, and the ascent of sap. Many of his results are noteworthy and, along with his experimental technique, will stand out as distinct contributions to the advancement of plant physiology. His conclusions, on the other hand, are quite a different matter. He is not content with presenting his results in straightforward narrative form but, in drawing conclusions, he indulges in extensive philosophical discussions which take the reader soaring into the realm of metaphysics. These metaphysical discussions and philosophical assertions have caused scientists quite generally to view Bose's work askance and in some cases even to belittle his unique and ingenious experiments.

In his philosophical discussion of the rise of sap in trees, Bose casts aside Dixon's cohesion theory based on the measured tensile strength of water and the theory of osmotic action. In lieu thereof he substitutes his vital theory based on the assumption that the propulsion of the sap is due to a rhythmic pulsating activity of the living cells corresponding to the heartbeats of animals. Bose's experiments on the influence of poisons and depressants on

the ascent of sap, while interesting, are not considered as sufficient evidence to bridge the gap between the knowledge existing at the time of his experiments and his dogmatic conclusions.

C. F. KORSTIAN.

Nursery Investigations. By H. M. Steven. *British Forestry Commission, Bulletin No. 11. 1928.*

The Forestry Commission of Great Britain has recently issued a most interesting bulletin (No. 11) on "Nursery Investigations." This bulletin shows that the number of coniferous plants used in state plantations in Great Britain increased from 4,511,700 in 1919 to 37,239,000 in 1925. The plants were raised, at the date of this report, in about the following proportions: Scotch pine 36 per cent, Corsican and Norway spruce 15 per cent each, Douglas fir and Sitka spruce about 11 per cent each, European larch 8.8 per cent, Japanese larch 1.7 per cent. On September 30, 1926, there were 729 acres in nurseries in Great Britain, 15 per cent being in seed beds, 61 per cent in transplants, 14 per cent in cleaning crops, and the remander in roads, compost heaps, etc.

The reforestation program in Great Britain was undertaken because of the great need for wood which developed during the war when shipping was either blockaded or the shipping space was taken by more important supplies. The number of plants distributed during 1925, which is the last year reported in this bulletin, appears much larger in contrast when it is stated that only 10,573,725 trees were distributed from the four nurseries in the Central Rocky Mountain District in 1928.

When Great Britain decided that it was necessary to have forests of her own the forestry commission went about it in a very intensive manner. All sorts of nursery and planting problems were thoroughly investigated. Unusual care was exercised in the technique used in the tests so as to guard against soil variations, insects, and weather conditions. Evidently the British idea of securing reliable experimental results is by repetition, for the tests are repeated many times and in different positions and locations so as to give fair averages. The results are then carefully analyzed and the differences are ironed out by the method of standard error.

The bulletin covers such practices as the season, method, depth, and density of sowing, the treatment and size of seed, tilth, weed problems, summer and winter protection, season and spacing of transplants, grading of seedlings, manuring, etc. It is interesting to note that many of the conclusions check those of Forest Service nurseries, despite the great difference in climatic conditions. The bulletin, however, is of greater interest from the standpoint of showing the intensive methods employed in nursery and planting investigations than in the practical application of the results in this country. Persons engaged in nursery planting or research work can review this bulletin with profit.

It was of interest to note that considerable trouble is experienced at British nurseries from the chafer larvæ, which are analogous in habits and feeding to the larvæ of the American May beetle, or June bug, known as white grubs. The

method of control ordinarily used is by digging and hand picking. In transplant areas where this practice cannot well be followed doses of carbon bisulphid are given with an injector; five gram doses up to seven in number per square yard have been effective.

I was also interested to note that quite a bit of American literature was consulted, and reference is made to articles by Carl Hartley, C. G. Bates, Jacob Roeser, K. L. Janouch, C. A. Scott, and others.

FRED R. JOHNSON.

Trees and Forests of Western United States. By Edward J. Hanzlik, U. S. Forest Service. *Pp. 128. Published at 502 Concord Building, Portland, Oregon, 1928.*

This book, describing the important native trees of the western United States, is based upon a series of articles originally appearing in the Four L Lumber News. The style is simple and readily understandable to the layman not versed in technical tree lore.

Before introducing individual trees, the author presents very brief chapters on tree growth, classification of plants, a description of western forest regions, the western national forests, and forest statistics. In the chapter on classification is a very helpful key to the identification of the western conifers. The tree descriptions that follow contain information that was formerly scattered or not readily available to the average reader. The treatment is rather complete in the points touched upon, although in an effort to attain brevity much is omitted. Although no uniform plan of treating each species is adhered to, the following particulars are covered—tree characteristics, reproduction, growth and yield, properties and uses of the wood, and enemies. Species like Douglas fir and western yellow pine are covered in considerable detail while others, for which the information available is less complete, are treated less intensively.

EMANUEL FRITZ.

Como se Defiende un Bosque. (How to Protect a Forest.) By Forest Engineer Don Joaquin Ximenez de Embun. *México Forestal 6 (9): 173-187. 1928.*

We are often inclined to reject simple methods of regulation because of their very simplicity and ease of application. The correct assessment of the cutting budget in any unregulated forest depends upon so many factors which are difficult of determination that complicated methods seem necessary, whereas simple methods dependent upon only a few definitely ascertainable facts may actually better meet the requirements of preliminary regulation.

Under the general title of "How to Protect a Forest," and in a rather elementary discussion of the characteristics of coppice versus high forests and the ordinary methods of protecting them from fire, insects, disease, and overgrazing, the author settles the correct assessment of the cutting budget as a matter of protection—"protection against the abuses of utilization."

Like most simple methods his is based upon our conception of how the cut is assessed in an even-aged, regulated for-

est. Inasmuch as, with such a forest, we cut annually the area occupied by the oldest age class, so, in an all-age but otherwise normal forest, we should cut the area occupied by the oldest age class. This area he would determine, in terms of number of mature trees to be cut, by taking the average crown spread of mature trees, multiplying it by the rotation, and dividing the product into the area of the forest. His formula would read:

$\frac{A}{an}$ = number of mature trees to be cut,

where

A = area of the forest in square feet,
a = area of the average crown spread of a mature tree in square feet, and
n = number of years in the rotation.

That such a formula will apply to a normal forest, whether even-aged or uneven-aged, is obvious, but its application to irregular forests of varying degrees of departure from the normal makes some modification necessary. The modification suggested by the author is to substitute for the total area of the forest the area covered by the closed crowns of the trees, so as to take the stocking of the forest into account. He assumes that it would be a fairly easy matter to calculate the reduction of area thus made necessary by direct observation in the field, an assumption hardly borne out by practical field reconnaissance.

Having made this calculation and determined the actual closed area of the forest, a reasonable rotation is selected, the average crown spread of trees of approximately this age determined, and the formula applied to find the number of trees to be cut. The correct cubic volume to be removed at each cut would then be that corresponding to this number of trees of rotation age, but in application this number of the largest trees in the forest is selected with the idea of removing first any overmature timber beyond rotation age. The assumption here is that, as the cut progresses through the years, the time will come when only trees of rotation age are found and then the forest will be normal for the area of closed crowns dealt with. If there are no trees of rotation age and size in the forest, then the cut proceeds to take the indicated number of the largest trees which, in this case, will cube to less than the indicated volume of the allowable cut. Here the assumption is that annually the volume of the forest will be built up toward the normal by the amount of the discrepancy between the actual and the allowable cut.

Unfortunately it is unlikely that these assumptions will hold except in unusual cases where the distribution of the lower diameter classes is relatively even, and the author admits that one defect of his method is that varying cuts will be obtained from year to year. Nevertheless the method has all the advantages of simplicity and, if stocking figures are available which would make it possible to assess the closed crown area, not difficult of application.

D. M. MATTHEWS.

Tropical Woods. Number 16, December 1, 1928. *Pp. 68. School of Forestry, Yale University.*

Number 16 of this valuable little quarterly is accompanied by a separate table of contents for numbers 9 to 16,

thus indicating that a second volume has been completed. The value of this journal becomes increasingly evident as we demand more knowledge of tropical forests and woods. It is the only and probably the first systematic American attempt to journalize current additions to the literature on tropical woods. To the editor, Professor S. J. Record, should go the principal credit for making "Tropical Woods" the journal it is, as well as for arousing in others the desire to add to the knowledge of his favorite field, to say nothing of the laborious task of bringing order out of the chaotic condition of tropical tree and wood referencing and nomenclature.

The current number is a representative example of the other numbers in the series. The articles vary from a note on an individual wood to a report on the arborescent species of a large region. Thus, 35 of the 68 pages are devoted to a consideration of "The Forests of Western Panama" by G. Proctor Cooper, and to lists of 661 specimens of trees and shrubs collected by the author. Especially important and useful is the check list of the common names accompanying the botanical list. A brief article on "New Trees of British Honduras," by Paul C. Standley, follows. Dr. Standley is also the author of two additional articles, "Five New Trees and Shrubs from Nicaragua," and "Two New Trees from Honduras." Dr. Standley is a frequent and important contributor to the magazine. To him apparently falls the task of studying new botanical material, determining specimens, and preparing technical descriptions. J. F. Macbride gives a brief but important note on the identity of a Peruvian mahogany, and David A. Kribs gives a comprehensive description of the wood of *Carya tonkinensis*. That there is a specimen of *Carya* outside the United States will come as a surprise to many who may have believed, as did the reviewer, that *Carya* was limited in its natural distribution to the United States.

Besides containing original articles and notes, "Tropical Woods" also devotes considerable space to reviews and notes on "Current Literature." The present number has 14 such reviews and notes. The publication of the journal is made possible by a gift to Yale University from the United Fruit Company.

EMANUEL FRITZ.

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Goat Grazing and Forestry in Cyprus. By A. H. Unwin, D. Ec., M. E. F. A., M. C. S. F. E., Principal Forest Officer, Cyprus. *Crosby Lockwood & Son, London, 1928. Pp. 163.*

"From the goat the Cypriot gets ten shillings' worth of produce in a year and over one pound's worth of damage."

This quotation from a British official in Cyprus might be taken for Mr. Unwin's text. He is writing largely for a limited local public of British officials and residents who, according to him, are not yet convinced of the damage done by goats to the forests, orchards, crops, soils, and water resources of the island.

In the ancient world the island of Cyprus was noted for its copper deposits and its forests, both of which were liberally exploited. Owing apparently, however, to its rugged topography and relatively small population, somewhat less

than one-fifth, or about 400,000 acres, escaped destruction and still remained under forest at the time of the British occupation in 1878. It was, nevertheless, in very bad shape owing to fires, reckless cutting, unwise turpentining methods, and grazing.

A forest service was organized and a trained French forester placed in charge. His recommendations included the organization into public forests of forest land to which no private title existed, fire protection, regulation of grazing, and the like. As a result public forests were established and protection measures and management plans were adopted.

Political pressure and consideration for the apparent welfare of a large class of goat grazers resulted in the issuance of too many grazing permits. This has continued up to the present time and in the opinion of the author has nullified much of the otherwise excellent work of the forest service in reduction of fires, regulation of cutting, and the like. The author's statements might perhaps be interpreted as meaning that the net result had been prolonging the cut rather than assuring sustained yield.

Indeed the goat evil seems to have increased rather than decreased, for although the number of these animals on the island has remained about constant during the 50 year period there are more of them in the public forests today than when first established. Sheep, although nearly as abundant as goats, are apparently not regarded as so dangerous; at least, little is said about them in the book. Cattle are largely absent.

With the British occupation has come peace and relative prosperity and a large increase in population, soil cultivation, and mining. Whereas 50 years ago goats were largely grazed upon the vacant lands surrounding the villages, today this land is in cultivation and goats are frequently excluded entirely by vote of the local inhabitants. The taking up of the vacant lands about the village for other purposes has resulted in increased pressure on the forests and greater numbers are now grazed upon them with or without permit. Goat grazing, which was formerly largely an affair of owners who had a few head for their own use, has become a commercial proposition, the goatherds selling the products, meat, milk, cheese, and hides in the growing cities and to the great mining companies.

That a technical forest service should, after fifty years of experience, have made so little progress in controlling grazing on its forests is sufficient indication of the difficulties involved, and an indication that necessity for grazing control should not be taken too lightly.

Several chapters are given over to discussion of goat grazing as it affects forests, soil, water supply, and general economic conditions on the island. Since the purpose of the author is largely educational he has also devoted a considerable space to discussion of damage to forests from grazing in other parts of the world, including the United States. In some cases he has quoted from non-technical writers, but mostly from foresters and from official or semi-official reports. The book contains a bibliography, but it is quite short compared with the enormous mass of literature involved and quotes only works in English.

While the author has by no means given us a detailed scientific study of the effect of goat grazing in Cyprus,

his conclusion, that it is incompatible with forestry there, seems to be amply substantiated both by his own work and that of those from whom he quotes. At any rate, one lays down the book to recall Sir Joseph Hooker's famous remark that the goat is one of the chief enemies of the human race.

P. L. BUTTRICK.

Utilization of Lodgepole Pine Timber for Poles. By R. W. Lindsay, Associate A. I. E. E., General Engineering Department, The Mountain States Telephone and Telegraph Company, Denver, Colorado. *A paper presented at the summer convention of the American Institute of Electrical Engineers, Denver, June 25-29, 1928, and printed in full in the proceedings of that convention.*

Timber depletion is the reason given by the Mountain States Telephone and Telegraph Company for a study of sources of poles. In 1923 it started out "to determine (1) whether or not satisfactory poles could be obtained from the native timber, and (2) whether or not a reliable preservative method could be developed to protect the poles after being placed in the ground. In order to decide whether or not satisfactory poles could be obtained from the native timber, three major questions had to be definitely determined:

"a. Whether or not suitable pole-making timber could be found in large quantities in accessible places and close to the railroad.

"b. Whether or not, from the standpoints of strength, shape, grain, etc., the timber would be satisfactory.

"c. Whether or not poles from this timber could be produced at prices equal to or lower than current prices of other poles."

Surveys made by the United States Forest Service show an available supply on the National Forests of Colorado and Wyoming of 200,000,000 poles, 25 to 85 feet in length, most of them under 50 feet. Mr. Lindsay emphasizes the advantage of sustained yield under Forest Service administration.

The following conclusions were reached as a result of two series of tests, one in 1911 and another in 1926:

1. Air-seasoned lodgepole pine is superior to western red cedar in all the mechanical properties determined.

2. Fire-killed lodgepole pine is only 80 per cent as strong as western red cedar at maximum load.

3. Fire-killed Engelmann spruce poles are inferior to cedar and pine in all mechanical properties.

4. The open tank treatment of the poles did not show a positive tendency either for increasing or decreasing the strength of the pole.

5. A slight tendency toward an increase of strength with a decrease in moisture content was noted.

6. Large knots or rings of knots were found very objectionable from the standpoint of strength.

7. The modulus of rupture for the 53 pieces averaged 7723 pounds per square inch.

"When considered as to shape, grain, and other physical characteristics necessary for satisfactory pole material, all

species—that is, Engelmann spruce, lodgepole pine, Douglas fir, and western yellow pine—would qualify and would rank in the order named in so far as desirability is concerned. This rating is determined by an examination of the timber after it is cut into poles, noting the taper, the size of knots, the twist in grain, the thickness of sapwood, the extent of undesirable scars, and other features inherent in its growth. Western yellow pine grows generally in rather open areas, is found in large trees and has large knots, moreover, extensive pole producing areas are scarce." However, "the lodgepole pine, because of its existence in such large quantities and in such favorable locations from a cutting and shipping standpoint, and also due to its greater fiber strength than that of the Engelmann spruce, was chosen as a logical pole timber with which to experiment."

Production costs are set forth as favoring the expansion of this industry and tests started in 1909 are cited to show a good survival of tank treated poles (88.4 per cent sound, 2.6 per cent containing decay, 9 per cent removed) after 17 years. Specification methods of production and treatment are dealt with in some detail.

Mr. Lindsay's conclusions are, in part:

"There is every reason to believe that tank-treated lodgepole pine poles will have an average life in service of at least 15 to 20 years, and possibly longer. There are many factors that affect the ultimate wire load of a telephone pole line, and often this load increases faster than was originally anticipated, with the result that the pole is found to be undersized long before it has been condemned; also, at times other unforeseen factors necessitate moving the pole before its life has been spent. In this territory it now appears that a pole with the lowest possible first cost and a fairly long life is more economical than a pole with a higher first cost and longer life. In other parts of the United States where the density of poles is greater and poles can readily be recovered and reset without damaging the treated portion, different conclusions may be reached."

H. D. COCHRAN.

"Oh Ranger—A Book About the National Parks." By Horace M. Albright and Frank J. Taylor, with a foreword by Stephen T. Mather. *Stanford University Press. 1928.*

This book (of 178 pages), fully illustrated, is written in a light, informal, and very readable style. There is a good deal of humor in it, and the humorous marginal line drawings by Ruth T. White add to its informality. The volume is about the National Parks but more especially about the Park Rangers. Many ranger stories and adventures are related (some, if I am not mistaken, are forest ranger stories), and the book is dedicated to the Rangers and their Chief, Mr. Mather. A very clear explanation is given of the difference between National Parks and National Forests, and between Park Rangers and Forest Rangers.

Some of the chapter headings give a good idea of the contents: "Dudes and Sagebrushers," "Speaking of Bears,"

"Wild Animals You May Know," "Goin' Fishin'," "Indians," "Nature's Notes," "Hey, Hiker," etc.

It seems that the Park Rangers have developed quite a terminology all their own, just as Forest Rangers have. In the Parks, there are "Dudes," "Sagebrushers" (tourists who drive their own cars), "Savages" (hired help), "Pearl Divers" (dish-washers at Park hotels), "Heavers" (waitresses), and "Pillow Punchers" (tent girls and chambermaids). Chauffeurs are known as "Gearjammers," while laundry girls are "Bubble Queens." Porters and bellboys are called "Pack Rats." Yearlong rangers are referred to as "Old-Timers," while short-term men are called "Ninety-Day Wonders."

Mr. Albright has been a Superintendent in the Park Service since its organization, and has more recently been made director to succeed Mr. Mather, while Mr. Taylor is a newspaper man. The book is published by the Stanford University Press. The Forest Service needs just such a book written about *its* rangers and their everyday jobs and problems.

JNO. D. GUTHRIE.

"The Slogan Book." Compiled by W. R. Mattoon, Extension Forester, *U. S. Forest Service, 1928.*

Mr. Mattoon has performed another useful service in getting together in compact mimeographed form a large number of slogans more or less in use in different parts of the country. They are classified and have to do with Forest Fires; Reforestation; Timber Conservation; Forest Influences; and Farm Forestry. According to the dictionary a slogan is any rallying or battle cry. If this definition is accepted, it is hard to accept some of Mr. Mattoon's phrases as slogans. Nevertheless the bulletin should prove useful to those responsible for propaganda work.

A. F. HAWES.

NOTES

Spacing for Shelterbelt Plantations on the Northern Great Plains[1]

For fourteen years the Department of Agriculture at the Northern Great Plains Field Station, Mandan, North Dakota, has been working on the problem of planting trees for shelter on the so-called dry land farms of the northern Great Plains. While available information does not yet furnish a definite answer to the question, "What is the proper spacing distance for shelterbelt trees?" it does seem to indicate an approximate answer, or rather the limits within which the correct spacing will be found.

It is obvious that a dense stand of trees will give more complete protection from the wind than will an open stand. Density also favors early shading of the ground, which helps to check the growth of grass and weeds, the chief enemy of tree growth on the open prairie. On the other hand, moisture or rainfall is the limiting factor to the growth of all plant forms in the Great Plains region. The annual rainfall in this area where farming can be practiced ranges from 10 to 20 inches. At Mandan the average is approximately 17 inches. The problem of spacing is essentially an inquiry into the question of how close trees can be planted to each other without reducing the amount of moisture available to the individual tree below the minimum required for normal growth.

In 1918 a number of experimental plantings were made at the Mandan Station in which different spacings were used. Several species were included, but the green ash was the only one on which both height and diameter measurements could be made with any degree of accuracy. While factors other than spacing must be considered to explain some of the variations in the measurements given in the accompanying table, the data indicate what has actually happened in an experiment in which spacing was a very definite factor. The height figures were obtained by measuring each tree and taking the average of all; diameters were taken in the same way at a point about six inches above the ground.

It will be noted that in this experiment increased space was obtained by widening the distance between the rows, the space between trees in a row remaining the same in all blocks. This method was chosen for what may be termed "mechanical reasons." Shelterbelt plantings are usually located so that the rows run across the path of the wind. Close spacing in the row produces contact between adjoining trees at an earlier age than does the equal distance, or "square," system for the same root feeding area per tree.

[1] Presented before the Northern Rocky Mountain Section, Society of American Foresters, Missoula, Montana, December 17, 1928.

In 1916 the Mandan Station set out the first of its coöperative shelterbelt demonstration plantings. These are actual farm plantings, planted and cultivated by farmers in accordance with instructions and plans furnished by the station. The planting stock is grown and furnished by the Department of Agriculture from its nursery at Mandan. About 3,000,000 seedlings trees have been used in the past 14 years for this work, to make a total of nearly 3000 farm plantations. One important purpose of this project has been to find out if possible, under farm conditions, what the best spacing is for shelterbelt trees. In earlier plantings a spacing of 4 by 8 feet was used. Subsequent plantings have been set out at spacings of 6 by 8, 6 by 10, and 6 by 12 feet. Height measurements and stand are recorded at five-year intervals. No direct comparisons can yet be made of the different spacings used in these plantations as they differ considerably in age. Within the next few years, however, some interesting data on the subject of spacing should be available.

The discussion must now enter the realm of opinion, for it is evident that the actual plantings under observation have not yet answered all the questions that may be raised.

The practical advantage of close spacing, that is to say, 4 by 4, or 4 by 8 feet, seems to lie in the fact that it shortens materially the period of cultivation, as compared to spacing distances of 4 by 10, 6 by 10, 4 by 12, or 6 by 12 feet. When the wider of these spacings is used, cultivation can and should be maintained for a period that roughly increases directly with the increase in distance. The advantage of the wider spacing lies in the fact that the individual tree receives a greater supply of moisture during the early years of growth, resulting in greater total annual increase in size up to the time it comes into competition for moisture and light with adjoining trees.

TABLE 1

AVERAGE HEIGHT AND DIAMETER GROWTH OF GREEN ASH PLANTED AS 2-YEAR-OLD SEEDLINGS WITH DIFFERENT SPACINGS, MANDAN, NORTH DAKOTA, 1918

Type of planting	Spacing feet	Average height[2] 1922 (Feet)	Average height[2] 1928 (Feet)	Average diameter[2] 1922 (Inches)	Average diameter[2] 1928 (Inches)
Green ash	4 x 4	5.2	10.1	1.4	2.2
Pure stand (250 trees)	4 x 8	6.2	10.9	1.8	2.8
Three row combination					
1. Boxelder	4 x 4	6.2	11.3	1.0	1.3
2. Green ash	4 x 8	5.4	12.6	1.5	1.9
3. Boxelder (25 trees)	4 x 12	6.2	16.1	1.5	2.5
Three row combination					
1. Boxelder	4 x 4	5.7	10.6	1.0	1.4
2. Green ash	4 x 8	5.5	11.7	1.5	2.3
3. Northwest poplar (25 trees)	4 x 12	6.1	12.1	1.7	2.6

[2]All figures are for green ash.

The practice of thinning suggests itself as a logical means of securing the early advantage of density of stand by close spacing without too severe competition for moisture as the trees increase in size. The majority of the people who make tree plantings in the Great Plains region are farmers with little or no previous experience with the technique of caring for trees, and there seems to be reasonable doubt that thinning would be done at the proper time without supervision of some kind.

Shelterbelt plantations begin to have practical value for shelter when they reach a height of 5 or 6 feet, which in the Great Plains will usually mean at the age of five years. At this time, from the viewpoint of protection from wind, they must have grown together in the row. This will not usually be the case if the trees are spaced farther than 6 feet apart.

The spacing problem may then be summarized by stating that for shelterbelt plantations trees should be set from 4 to 6 feet apart in the row and the rows spaced from 8 to 12 feet apart; and that by using the wider of the spacings suggested and prolonging the period of cultivation more vigorous growth will result during the early and more rapid growing period of tree development.

ROBERT WILSON.

THE POSSIBILITIES OF GROWING EVERGREENS IN THE NORTHERN GREAT PLAINS[1]

The northern Great Plains region includes North and South Dakota, Montana, and Wyoming to the Rocky Mountains. This area has a normal rainfall of from 24 inches at the eastern boundary to as low as 10 inches near the Rocky Mountains. In elevation it is also variable, with a continual rise from around 800 feet at the eastern boundary of the Dakotas to over 6000 feet in Wyoming.

In speaking of evergreens I shall include not only the native species but also those that have proved satisfactory from other parts of the country or abroad. My conclusions will be drawn from the conifer plantings observed in the various sections. In this region there are areas in which conifers grow naturally, such as the western yellow pine and juniper in the Badlands of North Dakota. The many ridges in eastern and southeastern Montana and Wyoming and northwestern South Dakota are from scattered to heavily wooded with western yellow pine. In Montana there are also western yellow pine and Douglas fir as far as the 107th meridian in the Missouri River breaks in Garfield County. There are also prairie-like areas on which western yellow pine grows in Petroleum County, in the central part of the state.

As the farmers came into the Plains from the east, many of them were from regions where conifers grew without difficulty. They either brought such evergreens with them or obtained them later. In the eastern part of North and South Dakota, farms may be found that have very fine conifer windbreaks. In most cases those that remain today are Norway or white spruce. An occasional small grove of Scotch pine may be seen, or jack pine, but they have not proven as

[1] Presented before the Northern Rocky Mountain Section, Society of American Foresters, Missoula, Montana, December 17, 1928.

satisfactory or as lasting as the spruce. In northern Kidder County, North Dakota, 45 miles east of Bismarck, there are two rows of Scotch pine that are probably 25 years old. These are on a deserted farm on the southeast of a hillside, with rows runnings east and west. There are evidences of many more rows having been originally planted. Brome grass and prairie sod have grown about them now; cattle graze and rub against them; and grass fires have many times gone through them, as evidenced by old charred places on the bark. In the spring of 1928 a prairie fire went through them which killed about a quarter of the trees. These trees are straight and shapely, and hardly look like the crooked Scotch pine usually seen in plantings.

In the southeast corner of Bottineau County, North Dakota, is a planting of white spruce which numbers about a thousand trees. These have had no care for many years and the farm buildings which they once protected have mostly disappeared. The trees are very closely planted but in spite of that have made good growth.

Along the Canadian boundary in Bottineau County are also several fine windbreaks of alternate spruce and hardwood. At many places in the eastern part of the state are single or small groups of conifers, generally spruce, that have been growing well. At Flaxton, in Burke County, North Dakota, a farmer is doing wonderfully well with conifers, having Colorado spruce ten feet tall. Conifers have been planted at the federal station at Mandan and at the state substation at Dickinson, North Dakota. At the latter the species are limited to jack and western yellow pine and white or Black Hills spruce. These are about 18 or 20 years old. At Mandan there are many blocks of different conifers, including jack, Scotch, red, lodgepole, and western yellow pine; white, Colorado, and American larch; Douglas fir; and red and white cedar. Most of these species are making fine growths. At Bottineau, and in the adjacent Turtle Mountains, isolated trees have been planted of white spruce and balsam fir, and both have withstood the conditions. In South Dakota near Castle Rock, Butte County, about 30 miles north of the Black Hills on the north edge of the "gumbo," is a fine planting of conifers, including western yellow pine and spruce, from two to five years old and as tall as seven feet.

The prairie section of Montana and Wyoming is too recently settled to give many examples of good conifer plantings. At the state experiment station at Havre the conifers planted in 1918 and 1919 have done remarkably well. These are yellow pine and Black Hills spruce. At the federal stations at Ardmore and Newell, South Dakota, they have also done fairly well. At Ardmore, which is in the southwest corner of the state, several plantings have had to be made in order to get a good stand. At Newell irrigation has been used and no difficulty is encountered. Many coniferous plantings were made over the Plains in the years following 1920 by the U. S. Field Station at Mandan, but practically all were lost due to the drouth, hail, or rabbit injury. More recent plantings, however, are proving successful to date. Jack rabbits seem to be the greatest foe to prairie plantings.

For the plantings put out from the Mandan station in the four states named, as well as those put out from the State Forest Nursery at Bottineau, North

Dakota, the requirements are a year's preparation of the ground, which must be situated in the lee of a windbreak of broadleaf trees. This seems to be an important feature in establishing such plantings. The snow piles up over them and protects them from the rabbits as well as the dry winter winds.

The conifer shelterbelt or woodlot seems to me to be the goal for prairie plantings. It is my opinion, however, that in practically all cases it must be preceded by the hardwood shelterbelt or woodlot in order to give the early protection needed by the conifers while they are becoming established. Another trying period in their growth will come when they are from five to ten feet tall. The snow banks that gave them protection when small will break off the branches, often stripping the trunk of all its side branches when the hardened snow banks settle in the spring. This has been observed in prairie plantings put out by the Canadian Forest Service. In the plantings put out by the State Forest Nursery at Bottineau, as well as the federal station at Mandan, a snow trap is always provided when possible. This is a clean space of at least 20 feet between the hardwood and coniferous plantings. The wider the hardwood plantings the lower the snow bank in the lee of it, as the snow settles in the trees rather than banking up on the leeward side and the bare space between the two types of plantings allows for the snow bank without injury to the trees.

The State Forest Nursery at Bottineau is also experimenting with conifers from other sections of the United States and Asia. Engelmann spruce, Douglas fir, and concolor fir have so far proven hardy to the North Dakota winters and hot summers. Time alone will tell their desirability.

It is my belief that coniferous planting is not only the ultimate solution of the prairie planting situation, but will be considerably hastened through the cooperation given the farmers in providing not only the young trees at a minimum cost but also the necessary information as to previous preparation and subsequent care which will assist then in obtaining a reasonable degree of success.

F. E. Cobb.

Chinese Elm (*Ulmus pumila*) [1]

This tree was first introduced into the United States in 1908 by Frank N. Meyer, Agricultural Explorer, from near Peking, China. It is a native of northern China, Manchuria, and eastern Siberia.

It is a very rapid growing tree, probably even faster than cottonwood or poplar in the Great Plains region. It has a tendency to branch close to the ground, and its branches are slender and wiry but somewhat brittle. The leaves, elliptical and smaller than the American elm, appear very early in the spring and remain longer in the fall than most trees.

To the present time the tree has been entirely free from the plant diseases and insect injuries common to other elms.

Since its introduction the Chinese elm has been quite extensively planted in the Great Plains region with considerable success. It is apparently readily adaptable

[1] Presented before the Northern Rocky Mountain Section, Society of American Foresters, Missoula, Montana, December 17, 1928.

to any type of soil and will withstand the most arid conditions. Its rapidity of growth and its adaptability to adverse conditions of soil and climate, together with its multi-branched, shade-giving crown, make it an extremely valuable tree for shade-tree planting. In the extreme north of the Great Plains region there seems to be considerable tendency to winter killing of the tips of the branches, sometimes even as much as 18 inches. This of course results in a certain amount of dead wood in the crown which is more or less unsightly unless trimmed off. Also, the brittleness of the wood results in considerable breakage if the tree is pruned up very high, unless it is growing in a more or less sheltered location.

As a windbreak or shelterbelt tree, the Chinese elm is very satisfactory. If left to its natural habit of growth it forms a very dense crown beginning quite close to the ground, and grows so rapidly that protection is afforded much sooner than with other trees. The Chinese elm does not require the care and protection that is necessary for good growth in the ash and American elm, but will thoroughly establish itself in two years. This characteristic makes it an easy tree for transplanting successfully.

A row of about ten Chinese elms obtained from the office of Seed and Plant Introduction, Department of Agriculture, about 1918, was planted in the State Forest Nursery at Bottineau, North Dakota. In 1926 they had attained a height of about 30 feet and a diameter breast high of 4.5 inches. About half of the trees were dead in the spring of 1926 and the remainder failed to survive the following winter. It was apparently a case of winter killing. No insect injury was found and no signs of disease. The trees were cut in the fall of 1927 leaving a two foot stump. In 1928 four of the stumps sprouted and produced clumps about five feet high. These trees were in an open field with little or no protection and had been quite severely pruned when young so that the lowest branches were about seven or eight feet from the ground. It is the opinion of the writer that this tree cannot be successfully grown this far north unless allowed to branch naturally and given a certain amount of protection.

According to a report prepared by Dorsett & Dorsett, Agricultural Explorers, this tree is used chiefly for hedges, screens, and formal plantings in its native land. In the spring of 1927 a row of 14-inch seedlings was planted in the State Nursery with a 16-inch spacing. These trees were raised at the nursery from seed that was imported from Mukden, China. The hedge was cut back three times during 1927 keeping it about 2 feet high. During 1928 it was trimmed twice at a height of 4 feet. The last cutting was made quite early, so that such winter killing as occurred could be trimmed off in the following spring.

This system of pruning would allow the cutting off of dead tips and still not lower the height of the hedge. The trees branched most profusely and low, resulting in an excellent and very dense hedge.

To propagate the Chinese elm one has the choice of three methods: root cuttings, stem cuttings, and seed. Of the three, the latter is probably the best, easiest, and cheapest. Root cuttings sprout quite easily, but for stem cut-

tings a greenhouse is essential and the percentage of loss is likely to be high.

The seeds mature so early that it is difficult to obtain seed locally. Only in the southern states is there much hope for American grown seed. There have been good seed years in the southwest corner of North Dakota. Trees planted by the Mandan Station on the farm of Mr. B. L. Schmitz, Lark, North Dakota, in 1916 have produced several good crops of seed in the past 5 or 6 years. The trees above mentioned at the State Nursery have annually produced flower buds in large quantities but late frosts have each time destroyed them. In the spring of 1927 a framework of two by fours was erected around one tree and covered with black cambric in an effort to protect the buds, but with no success.

The seed of the Chinese elm, unlike that of any of the native elms, is able to retain its viability for two or three years. The writer has personally planted seed one, two, and three years old and found but very slight loss in germination capacity. This seed was stored in a cloth sack and hung in an unheated shed during this time. This was also seed imported from Mukden, China.

In sowing Chinese elm seed, two methods were used at the State Nursery. Sowing the seed broadcast in seedbeds and transplanting the second year did not prove as satisfactory as sowing the seed in drills in the field and leaving it without transplanting. The chief difference was in labor and cost of production. The seed sown direct in the field produced just as sturdy and a trifle larger tree in two years than that sown in the seedbeds.

Although the Chinese elm has such faults as winter killing and brittleness of wood, especially in the northern states, still it apparently has enough good qualities to make it a tree well worth planting in practically any part of the United States and especially in the Great Plains region.

S. S. Burton.

National Versus Local Forest Programs

December 27, 1928.

Col. Henry S. Graves,
Yale Forest School,
New Haven, Conn.

Dear Colonel Graves:

You may remember that at the annual meeting of the Society last year you and I had a friendly tilt over the question of the value of national *versus* local programs for the development of industrial forestry. The following article by Raphael Zon, entitled "If I Were a Northern Farmer," which is quoted from the Development Bureau News (Michigan) of September 1, 1928, strikes me as an excellent example of the kind of local appeal which will do a whole lot more good than a nation-wide call to action:

In this article I am trying to place myself in the position of a northern Michigan farmer who is considering certain definite policies outlined of late years by State and Nation, and for which policies my support is asked.

Take the question of conservation, which we all agree is a great one. Most of the conservation policies are written by city people. Often they overlook the needs of country folk, especially the farmers or settlers in a semi-settled northern country like the upper peninsula of Michigan.

To a farmer in the sparsely-settled new country of the north, the question

of orderly land settlement should be of vital importance. Haphazard, hit-or-miss settlement should stop. The state should assume definite responsibilities for the selection of land to be settled, and it should aid the settler to make a success on the land.

If I were an upper peninsula settler I would certainly insist on the land economic survey as a basis of land development. This survey could be expanded and more of the economic side emphasized.

As a north country settler I would favor the maintenance of permanent timber production on all land unsuitable to agriculture. If the settler is to succeed he must have a market for his farm products in the lumber camps and mills and other wood-using industries, and also a market for his own labor and teams in winter logging and milling operations. The settler can consistently support a program of effective fire protection, forest planting, selective logging, and measures like forest taxation, that will keep the forest land productive.

As a settler I would insist that in any plan for fire protection in the north country, special effort should be made that settlers' homes should be as fully protected against fire as the cut-over land itself. Every big forest fire means so many settlers burned out.

I would be in favor of developing the region as a great recreational and tourist country. This means again a market for farm products. I would favor the beautification of the highways and would emphasize the need of opening up the country by such roads as would give every farmer access to the main highways. It is the country roads over which the settlers travel most, and not the main highways.

In the matter of fish and game, I would of course be for public shooting grounds and for public game refuges.

If I were a farmer living in the settled agricultural section of southern Michigan, I would endorse all of the above measures and I would ask for a few others.

I would like the State and Federal Governments to pay more attention to reforestation in the southern part of the state. The study of flood reports shows that the most dangerous areas from the standpoint of floods are not in the north, but in the easily eroded hilly country of the south. These eroded hills should be covered with forests.

As a woodlot owner in southern Michigan I would insist that the State agricultural college provide more forest extension specialists to teach the farmers how to take care of their woodlots, and especially how to market the forest products.

I would be particularly anxious to see that the streams were not polluted, so that the farmers in the lower stretches of the rivers could have as good fishing as the people of the north, with an unpolluted supply of water for themselves and their cattle, and swimming holes for their kids.

I would support the policy of the conservation department in assisting the farmers to propagate small game such as pheasants, quail, etc., as a possible additional source of revenue.

I would favor studies on a much larger scale of means to prevent gullying, and for the retention of soil fertility on the hilly farms, by means of reforestation or other engineering works.

I would be for any measure that would help to beautify and make more wholesome life in the country. I would ask assistance from the state in planting shelter belts around my farm and my home, and in the safeguarding of my water supply. I would certainly support any measure that would prevent turning over my land without my consent for shooting or fishing purposes to any men in the city.

These are some of the thoughts that come to me when I look upon our conservation policies from the standpoint of a Michigan farmer interested in conservation.

Zon has very strikingly placed before the residents of a region much in need

of forestry developments the reasons why they themselves should be active in promoting them. Do you not think that this is almost sure to get more results in the shape of trees growing on the ground than ten times that amount of space employed in spreading the word over the United States that we are cutting timber four times as fast as it grows, or trying to get the state of New York excited over the fact that the state of Wisconsin pays an annual freight bill of so many millions of dollars for lumber shipped into what was once a self-supporting lumber region?

I realize that building up a man's general physical condition will have some beneficial effect on the growth of his hair, but experience seems to indicate that the most successful way of avoiding baldness is to provide local massage for the scalp itself. I wonder if that isn't the way we are going to get the trees grown on the local acreage.

Very sincerely yours,
C. M. GRANGER.

January 4, 1929.

Mr. C. M. Granger,
United States Forest Service,
Portland, Ore.

DEAR MR. GRANGER:

I have your letter of December 27, quoting Zon's excellent statement, "If I Were a Northern Farmer." Since receiving your letter I have been trying to recall the details of our colloquy in San Francisco, and to discover the possible relationship between anything that I said and Zon's article, or the deficiency in growth and freight bill arguments for national support of forestry. If you will look over my remarks as printed in the JOURNAL in March, 1928 (page 376), you will see what I had in mind. During the entire meeting at San Francisco I had the impression that the real problem that was troubling everyone was kept in the background. My remarks were designed to call attention to the fact that there is an economic problem that extends beyond the boundaries of a single state or region, comparable to that of oil and soft coal; and that I would like to see it command the sympathy of the whole nation, for I believe national help will be needed in its solution. This has nothing to do with any question of a national *versus* a local program of forestry. It is a question whether the economic problem that every forester and lumberman faces on the Coast and elsewhere is a local problem. I do not think so. The solution involves many factors, perhaps the federal law relating to curtailments of production by agreement.

As for myself, I have been so preoccupied with my educational undertakings and with my efforts to get people to see the value and necessity of local action, from the standpoint of land utilization, with all its economic and industrial benefits, that I have had little occasion to talk about "freight bills." My efforts in national forestry have been directed to counteracting the reaction against the federal acquisition program. I perceive also reactions that may materially affect the increase of subsidies for fire protection and perhaps other federal activities. I dare say that I shall again be brought into the picture, but I don't know in what way.

All of this is to explain what I have been doing and that we do not differ in

the need of emphasis on local programs. You cannot leave out the Federal Government because the Government is already deep in the undertaking through the Clarke-McNary Act, and the nation is not yet convinced that we need to spend much more money through that authorization.

With best wishes, I am,

Sincerely yours,

H. S. GRAVES.

CREATION OF OUACHITA NATIONAL PARK NARROWLY AVERTED

It is no cause for congratulation to the opponents of the bill to create Ouachita National Park in Arkansas, that it took the pocket veto of President Coolidge to kill it. This would-be-national-park, which according to the terms of the bill would have been carved out of the existing Ouachita National Forest, came to national attention seriously for the first time in the summer of 1926 when the National Parks Conference met for its annual convention in Hot Springs, Arkansas. Representatives of the Mena Chamber of Commerce, interested in the area because of its proximity to their village, conducted an excursion to the proposed site for the benefit of the visiting delegates and urged its appropriateness as a national park. No great enthusiasm was exhibited by the visitors beyond courteous appreciation of the natural beauty of the region.

Congressman Otis Wingo of Arkansas, who has been the champion of the legislation, introduced the bill H. R. 5729 early in the first session of the 70th Congress and hearings were held by the Public Lands Committees of both houses in February, 1928. No notice was given to the general public of the Senate hearing, which occurred on February 1 and at which a large number of people from Arkansas and the surrounding states presented their arguments. At the House hearing on February 2, however, witnesses from the Forest Service, the National Park Service, and the American Forestry Association were present in addition to the champions of the bill.

Both the Department of the Interior and the Department of Agriculture recommended the defeat of the legislation, because of information from their own representatives that the area was not up to national park standards with respect to scenic features and that under the management of the Forest Service it was furnishing to the people of the region the recreation facilities which they were demanding in the legislation. The inadvisability of taking on for national park purposes an area which contained 163,000 acres gross, with 35,000 acres privately owned, was also brought to the attention of the committees by the Secretary of the Interior.

Mr. Wingo at the House hearing on February 2 offered what seemed to him a complete answer to the various objections, facetiously admitting that the area was not characterized by any freak. His favorite expression in this direction concerned the absence of five-legged calves and in lieu of them the beauty and grandeur of the highest range of mountains between the Rockies and the Appalachians. As far as the privately owned land was concerned, Mr. Wingo told the Committee that "It will not cost the Federal Treasury one dime more to buy that privately owned land for the National Park Service than it will to buy it

for the Forest Service." Following this he explained further that the real objection to making a national park out of this area was probably friction between the two bureaus.

Throughout the arguments of the representatives from the region affected, there was a noticeable plea for a place which people from the warmer southern country could reach with a short journey for recreation and rest. Arguments on the part of the opponents of the bill that the legislation could in no way change the character of the country and that it was already open to such use under the jurisdiction of the Forest Service, brought out that there was another reason for establishing the park. This seemed to be a feeling that as a park it would be opened up with roads more rapidly and that people from the surrounding states would be attracted in great numbers. Much was said by the delegates about the geology of the country and the distinctive flora. Novaculite occurs here and is of great interest because it was used by the Indians for shaping arrowheads, spearheads, and hatchets.

Colonel W. B. Greeley of the Forest Service and Mr. Arno B. Cammerer of the National Park Service were cross-examined by members of the Public Lands Committee and taken to task for incomplete study and examination of the area from the standpoint of national park use. No other witnesses opposing the bill were heard on February 2, but consent was given for the filing of statements.

Further hearings were held by the House Committee on March 27 and April 3. The first gave Congressman S. Harrison White of Colorado a chance to answer some criticism of alleged partisanship in favor of the legislation. At this time also the representative of the American Civic Association was heard in opposition to the bill and District Forester E. W. Kelley was given a chance to explain the plans of the Forest Service with respect to timber growing and recreational use of the Ouachita National Forest. Congressmen aside from members of the committee were also heard and Congressman Louis C. Cramton of Michigan testified as to the inappropriateness of the legislation.

Throughout the hearings before the House Committee the statement that there is such a thing as national park standards was continually challenged. Irritation was evidenced by the Committee and by Mr. Wingo because of the implied question of the power of Congress to transfer land purchased under the Weeks Law for national forest purposes to the national park category. No particular brilliance characterized the testimony of the opponents of the legislation. Unfamiliarity with the tract in question handicapped them, and the fact that national park standards rest on example and precedent rather than on exact definition brought up again and again the question, "What is a National Park?"

The opposition, however, was successful in eliciting a minority report in opposition to the bill. This minority included Congressmen Colton of Utah, Hooper of Michigan, Leavitt of Montana, Winter of Wyoming, and Douglas of Arizona. Showing entire sympathy with the need of the people of the region for a recreation center, the minority stated their belief that more rapid development of the recreation facilities by

the Forest Service would bring about what the people really wanted. They came out squarely against the creation of Ouachita National Park in the statement, " It will mean that we shall create parks based upon the theory of local demand or general distribution."

The opponents of the bill felt that since it failed to come up on the regular calendar Wednesday assigned to the Public Lands Committee it would not be considered previous to March 4, 1929, and that it would die with the close of the 70th Congress. Much to their surprise, however, on February 16 the Senate Committee on Public Lands and Surveys filed a favorable report on Senator Robinson's companion bill, S. 675, with certain amendments, and the bill was passed in the Senate without opposition. As a matter of fact, the Senate amendments would have made it extremely difficult to establish Ouachita National Park since they provided that the national park should be created " only when title to all lands within such area and now privately owned shall have been vested in the United States," and further " that the United States shall not purchase by appropriation of public moneys or otherwise any land within the aforesaid area, but that such lands shall be secured by the United States only by public or private donation."

On February 27 the Senate bill was considered by the House. For a short time it looked as though the unanimous consent request of Congressman Hill of Washington for consideration of the measure would be defeated on a point of order by Mr. Colton of Utah. The point was made that the bill was not on the House Consent Calendar because it appropriated property of the United States. However, the point was ruled against and in spite of brilliant arguments against the legislation by Mr. Cramton of Michigan, Mr. Colton of Utah, and Mr. Douglas of Arizona, the bill was passed.

It is quite generally thought that many of the 164 votes in favor of the bill (71 votes opposed) were the result of pledges made before the true nature of the legislation was understood. But whether this be a fact or not, the spectacle of Congress favoring national parks, created on what Congressman Colton calls " the theory of local desires," threatens the entire national park system. Furthermore, the easy abandon with which congressmen would junk national forests built up from scraps of public domain and land purchased under the Weeks Law, should give pause to any who feel that our national forest system is safe.

There is rumor that the support gained for this legislation cannot be mustered again and that the bill will not be reintroduced in the coming special session of Congress or the one following it. It is further felt that President Hoover is too well informed to sign such a bill if it reaches him. However, determined championship of this measure and the pork flavor which characterizes it gives a fine chance for trading and for actual victory eventually. Members of the Society of American Foresters were conspicious by their absence at the hearings. The Society itself filed no resolution in opposition to the legislation. No representative of the Society appeared against it. It would be a real service if the Society could send a representative committee to examine the area thoroughly, to

interview the local people, and to be prepared for the next attempt to dismember the Ouachita National Forest.

SHIRLEY W. ALLEN.

THE COMPLICATED CONTROLS OF FIRE BEHAVIOR

It is generally conceded that a forester primarily experienced in any other timber type has a lot to learn before he becomes a successful fire fighter in the Idaho white pine type. Likewise an expert from the white pine region usually is at loss when he first encounters fire in Douglas fir and hemlock on the West Coast, or in jack pine in the Lake States, or in chaparral in California. Although forests are burning in all these cases, the controls and the fire behavior seem to differ very appreciably.

Volume, growth, and yield of timber also differ from one of these regions to another. To determine the amounts of the variations and the reasons for them we use the scientific method of sample plots. Years ago we gave up the observational method of studying timber growth in favor of the more accurate and complete accounting possible by use of sample plots. Yet the factors controlling growth can hardly be much more complicated than the factors controlling fire behavior.

But we still go out on fires, measure the humidity and the wind, listen to the roar of the flames, take a glance at the forest type going up in smoke, and conclude that when the relative humidity is less than 25 per cent forest fires crown. Very simple, easy to understand, based on evidence, and the conclusion is received with acclaim. In other regions similar single-track observations concluded that when the evaporation rate was above 20 grams per day, or the wind above 15 miles per hour, or the vapor pressure below .150, or the duff moisture below 10 per cent, depending upon the region, forest fires crown, or at least spread very rapidly.

The process of realizing that all these factors entered into the behavior of fire produced some glorious debates, arguments, and articles. Such an excellent airing of the case made us all appreciate that even these factors are not all that are important. We are beginning to understand the fact that you can't estimate fire behavior and account for it accurately, any more than you can estimate timber growth and account for it, without measuring several factors. We do not attempt to cruise 100 per cent of the trees on a large area, and we cannot attempt to measure all the factors on the entire front of a large fire. But we should be able to account for most of the factors consistently if we use the sample plot method and a uniform system of measuring and recording.

To provide a convenient and uniform method of collecting data in this way, a new form has been devised, after consultation with several men engaged in fire research. Besides the data locating the plot, detailed statements are called for under Timber Type, Underbrush, Weeds, Ground Surface, Dead and Down Wood, Duff, Overhead Fuels, Transmission of the Ignition Temperature, Atmospheric Factors and the Concurrent Behavior of the Fire (dying down, died down, picking up, and picked up), Effects of the Fire, and Effects of Topography and Wind. Samples of this form may be obtained on application to

any of the Federal Forest Experiment Stations. Some critics have denounced the form as impossible because of its extent and its complications. Others say that we cannot install the plots ahead of a going fire and obtain the data on pre-fire factors before the plot is burned over. Still others claim that the fire we wish to observe will drive us from our observation posts. A few of us, however, believe that we can install plots, that we can record all the facts even as the fire crosses the plot, and that from such work we will find that certain conditions are fundamental, and certain others superficial and temporary. In fact, three plots were installed in northern Idaho during the 1928 fire season, with decidedly interesting results.

When we really understand the existence of and the difference between the fundamental and the superficial factors we should be able better to explain fluctuations of fire danger and differences in fire behavior in various regions, which seem to demand different tactics of prevention and suppression. Perhaps when we know more about all the factors we will be able in new ways to improve our protection tactics, and our success in the practice of forestry. Very few improvements have been made in any system without new knowledge, or by doing the same old things in the same old way.

H. T. Gisborne.

Solid Train Load of Douglas Fir Plywood

A train of forty cars loaded with Douglas fir plywood pulled out of the Northern Pacific Yards at Auburn, Washington, on February 2, consigned to the R. C. Clark Veneer Company of Chicago, one of the leading plywood distributors of the country. Approximately two million square feet of plywood panels were necessary to complete this, the largest single shipment of Douglas fir plywood ever sent from the Pacific Northwest.

University of California Opens Ph. D. to Foresters

By action of the Academic Senate of the University of California, the entire scheme for permitting students to proceed to candidacy for the Ph. D. degree has been changed. Heretofore a student became a candidate for the doctorate with a "major" in the department of his greatest interests, and a "minor" in a related department. The departments in which a student was allowed to become a candidate were limited to the usual traditional groups. Under the new plan, the student will no longer have a major and a minor, nor will there be a list of departments in which he may have his work. Instead, the student chooses "a field of study." This may lie in one department except for essential related subjects, or it may represent combinations of departments.

Under the new plan, forestry will have the same status as all other departments in the University. A field of study can be chosen in forestry just as in botany, economics, or philosophy. Naturally the student must fully qualify, both in fundamental training and in the quality of his graduate work.

This definitely places the University of California among the institutions in

which a properly qualified and able man can proceed to the doctorate with his work in forestry and gives forestry, as a field of study, appropriate recognition.

EMANUEL FRITZ.

CALIFORNIA FOREST SCHOOL OFFERS FELLOWSHIPS

Two fellowships, each carrying a stipend of $750 payable in ten equal monthly installments, are being offered for 1929-30 by the school of forestry at the University of California, Berkeley, California. These fellowships were formerly known as research assistantships. The change in name, however, does not alter their purpose or requirements. The applicant must have received a bachelor's degree and must have completed at least 20 units in a department or school of forestry of good standing. The appointments are for one year.

The University of California also announces several assistantships. These are available through coöperation with the California Forest Experiment Station. The qualifications are the same as for the fellowships, and appointments will be made from the same list of applicants. Holders of assistantships are paid at the rate of $60 a month, for which they are required to give an average of 90 hours of work for the station or the school. Holders of fellowships, on the other hand, have their full time free for study and research.

FOREST VERSE WANTED

Almost ten years ago I published a little book called "The Forest Ranger and Other Verse." It was made up of stray verses written by different people, much of it having originally apeared in forest news letters or forest school papers.

Encouraged by the reception accorded this first modest effort, I am now engaged on a second collection of similar verses, which I propose to publish. Poems or verse dealing with the life of the forest ranger or the forester, or with any forest work, are wanted. I already have some 200 verses—good, bad and indifferent—but I should greatly appreciate receiving any forest verses which any reader of the JOURNAL may have. Verses touching on the work of state rangers or wardens, and foresters in private employment, or by them, are especially wanted.

JNO. D. GUTHRIE.

University Club,
Portland, Oregon.

SOCIETY AFFAIRS

Society Committees

President Redington announces the appointment of the following committees:

COMMITTEE OF FOREST POLICY

Barrington Moore, *Chairman*
George P. Ahern
O. M. Butler
F. C. Craighead
I. F. Eldredge
Clarence L. Forsling
Henry S. Graves
William B. Greeley
Wm. L. Hall
R. C. Hall
J. S. Holmes
Don P. Johnston
J. P. Kinney
Aldo Leopold
P. S. Lovjoy
D. T. Mason
E. P. Meinecke
F. H. Newell
Axel H. Oxholm
Carlhes Lathrop Pack
Gifford Pinchot
J. F. Preston
Franklin Reed
Ward Shepard
F. A. Silcox
Hugo Winkenwerder

COMMITTEE OF FOREST EDUCATION

R. Y. Stuart, Chief, U. S. Forest Service
I. W. Bailey, Harvard University
E. H. Clapp, Chief of the Branch of Research, U. S. Forest Service
Livingston Farrand, President, Cornell University
H. S. Graves, Dean, Yale School of Forestry
W. B. Greeley, Secretary and Manager, West Coast Lumbermen's Association
L. R. Jones, University of Wisconsin
D. T. Mason, Consulting Forester
Barrington Moore, Editor of Ecology
Charles Lathrop Pack, President, American Tree Assn.
W. A. Pickering, Pickering Lumber Company
R. B. Robertson, President, Champion Fibre Co.
Ward Shepard, In Charge of Public Relations, U. S. Forest Service
E. O. Siecke, State Forester of Texas
Paul Redington, President, Society of American Foresters (ex officio)
R. E. Marsh, Secretary, Society of American Foresters (ex officio)
J. F. Preston, Hammermill Paper Co.

Attendance at the Annual Meeting

During the closing minutes of the last day's session of the annual meeting in New York, the question was raised as to how succeeding annual meetings of the Society might be improved. It occurred to me that one good way to improve

the character of our annual meetings was to have a more representative turnout of the members, within relatively easy accessibility of the meeting place.

I have attended all the annual meetings in the East for the last ten years and I think the 1928 meeting surpassed all the others that I have attended from the standpoint of professional interest and good fellowship. I felt that as a professional forester I simply could not have afforded to miss it. Yet as I looked around the room I couldn't help feeling that there was a mighty meagre showing of professional foresters for a society as big as ours, meeting in such a center as New York.

It seemed advisable to do a little investigation to see whether attendance figures bore out my impressions. This is what I found:

Approximately 166 people registered their attendance at some or all of the sessions. Of this number, 140 (80 per cent) were professional foresters, members either in the United States or Canada. The other 20 per cent included representatives of allied interests or personal friends of members and undergraduate foresters. To get a real picture of the membership representation at the annual meeting, it seemed fair to consider only the New England, New York, and Allegheny Sections. Practically no forester within these three sections would have to travel more than 350 miles to get to New York.

From these three sections there were in attendance 104 members. The remaining 36, coming from other sections or Canada, included 14 from the Washington Section. Inquiry from section secretaries developed the fact that there is at present a Junior and Senior membership of 425 in these three sections. In other words the attendance was 25 per cent of the total membership of those sections. I am not familiar with what percentage of attendance other professional bodies obtain at their annual meetings, but I raise the question whether 25 per cent is a fair representation.

Analyzing the attendance from these three sections from the standpoint of employment, the results are as follows: government, 8; state, 27; municipalities, 2; educational institutions, 36; private, 31. The fact that there are 36 foresters in private employment living in New York City or its environs accounts for the large number of private foresters in attendance. The concentration of many forest schools within the three sections brings up the record of the educational group. The attendance of state forestry officials is very small, however, considering that within the three sections there are included 11 states with forestry departments. Two states within the sections were not represented at all.

J. A. Cope.

New England Section Holds Lively Meeting

The annual winter meeting of the New England Section was held at the Hotel Bond, Hartford, Conn., January 31, 1929, in conjunction with the Third New England Forestry Congress. The program dealt largely with two subjects, marketing and silviculture. In view of the prominent place given the former subject in the activities of the Section during the year 1928, several well-known lumbermen were invited to attend the meeting.

In the morning session reports were presented by T. S. Woolsey, Jr., Chairman of the Flood Committee; A. C. Cline, Chairman of the Industrial Forestry Committee; and A. F. Hawee, Chairman of the Market Committee. Colonel Woolsey's report dealt with the damage caused by the 1927 flood, and recommended ways and means of preventing such disasters in the future. (This report will be published in the Proceedings of the Congress.) Mr. Cline's report summarized the progress made on the Society's Industrial Forestry Inquiry, and indicated that the work would be completed during 1929. Mr. Hawes' report covered the three special projects on which the Market Committee worked during the past year, namely, (1) the marketing of New England hardwoods on the Pacific Coast, (2) the manufacture of hardwood dimension stock, and (3) the use of low grade hardwoods for pulp. Several hundred circular letters had been sent by the committee to West Coast lumber dealers in an effort to determine what the prospects were of marketing New England hardwood in the far West. The replies showed a considerable interest in New England hardwoods, and all promising leads are to be followed up as soon as the Section can place the information in the hands of local hardwood producers. The enlargement of the hardwood dimension business seemed very promising to the committee. Mr. Kneeland, President of the Kneeland-Morrill Co., dealers in hardwood dimensions, furnished the meeting with many pertinent facts and figures concerning the business, and predicted a prosperous future for it. The methods of manufacturing hardwood pulp were outlined, together with costs, yields, etc., and the urgent need of a market for low grade hardwoods pointed out. It seemed to be only a question of time when such material, now largely without a market, would find its way into pulp and paper.

Following these committee reports Wilson Compton and Mr. Bravo of the National Lumber Manufactures Association spoke on the subject of trade extension as carried out by their Association in New England. This is a large scale effort to educate the public in the proper use of wood, and to advance the interests of the lumber industry. Mr. Bravo assured the Section that New England was receiving its full share of trade extension effort, and in closing suggested a closer coöperation between all agencies interested in the advancement of forestry and in the utilization of forest products.

At the afternoon session the subject of silviculture was introduced by R. T. Fisher, Director of the Harvard Forest, who first summed up the progress already made in silvicultural practice in the region, and then suggested courses to be followed in the future. He pointed out that past efforts had centered largely around the establishment of plantations, chiefly of white pine, and, while recognizing the continued need for planting, urged that more consideration be given to the improvement and care of existing wild stands on both cut-over and abandoned farm land, and to the production of mixed stands. Greater emphasis might well be placed on such silvicultural treatments as weeding and releasing.

E. S. Bryant, Chairman of the Committee on Improvement of Composition, then read a progress report covering the work of his committee on the subjects of releasing pine or spruce from overtop-

ping inferior hardwoods by either girdling or cutting, the weeding of young, volunteer stands of hardwood or pine and hardwood on cut-over lands, and the weeding of softwood plantations on both cut-over and abandoned farm land. The report showed that the Committee had visited practically all of the forests in the region where these operations had been carried out on any considerable scale, and that a growing interest was being taken in these forms of improvement work. M. Westveld, a member of the committee, reported on a specific case of spruce release on the Corbin Park (N. H.) forest, which showed a decidedly profitable outcome over a twenty year period since the operation.

Much comment followed the conclusion of the arranged program on silviculture. It was stated that there was an urgent need for the demonstration of such silvicultural treatments as Messrs. Fisher and Bryant had spoken of; that actual demonstration is what counts in educating the public; that the public forests should include areas suitable for demonstrating such treatments as weeding, releasing, and girdling; that planting was easier to put across to the public and legislatures than other silvicultural operations; that a large part of the forestry problem involved the education of the public in forestry; that the most promising ways of getting forestry practiced on small private holdings were through the formation of small, compact regional associations, or to start well trained consulting foresters in favorable localities.

The evening meeting of the Section was opened by Harris Reynolds, Chairman of the Committee on Public Education in Forestry, who stated that his committee would carefully examine and appraise all tried and proven methods in public education, paying particular attention to cases where a satisfactory start had been made in forestry practice, and bearing in mind the well known principles of salesmanship.

Two important papers were next presented, one by W. N. Sparhawk of the U. S. Forest Service on " The Softwoods of the Northwest in Relation to Forestry in New England, " the other by Julian E. Rothery of the International Paper Company on " Canadian and Southern Pulpwood in Relation to Forestry in New England." Both of these papers showed that, while the practice of forestry in New England is just at present hampered by economic forces involving among other things large supplies of cheap virgin stumpage in other regions, a prosperous future is in store for New England forestry and the numerous industries dependent thereon, providing the necessary steps can in some way be taken to build up the growing stock of the forests of the region, now in a more or less depeleted condition, so that, as other regions are reduced to a second growth status, transportation differentials will become effective, and New England forests can satisfactorily supply the demands of its industries. The problem seemed to involve the inauguration of a large scale program of forest renewal and improvement in the fact of present unfavorable economic conditions.

The last subject brought before the meeting was the giving of free technical advice to timberland owners by publicly supporter foresters, such as extension foresters, state foresters, and forestry teachers in state colleges, and the effect of this upon the future of the profession, especially as regards the opportunity for private, consulting foresters to build up

a practice. Numerous comments were made but no definite conclusions arrived at. The fact remains that a great deal of technical advice is being furnished free of charge, and that the chances for private consulting foresters to become established are none too good, but the relation between these two conditions was not at all clear. It could not be assumed that the latter condition was a result of the former, and E. S. Bryant, a consulting forester, went so far as to say that public foresters made more jobs for private foresters.

A great deal of interest was shown in the committee reports and papers presented at the meeting, and the Executive Council and Committee Chairmen felt encouraged to continue with the large program of work outlined for 1929.

E. C. Hirst of Concord, N. H., and A. C. Cline of Petersham, Mass., were reelected Chairman and Secretary, respectively. New members of the Executive Council were George T. Carlisle, Jr. (Maine), Harris A. Reynolds (Mass.), and Prof. R. C. Bryant (Conn.). Members whose terms expire at later dates are R. M. Ross (Vermont) and H. I. Baldwin (N. H.). The total membership of the Section stood at 165.

The Section accepted the kind invitation of Elwood Wilson, Manager of the Laurentide Forestry Division, Canada Power & Paper Corporation, to hold its summer meeting at Grand Mere, Province of Quebec.

A. C. Cline,
Secretary.

Winter Meeting of New York Section

The program of the State Reforestation Commission was discussed by Nelson C. Brown at the winter meeting of the New York Section held in Albany on January 30. This resulted in the endorsement by the Section of the plan to develop state forests and to build a system of county forests outside the Forest Preserve Counties. The continuation of the Reforestation Commission was also urged.

Clifford H. Foster discussed Thinnings in Natural Stands. Joshua A. Cope presented a paper on Black Locust in New York, and Arthur S. Hopkins made suggestions for service by the Section to the Conservation Department.

An interesting feature of the meeting was a discussion by A. B. Recknagle of twenty current publications of interest to foresters.

A motion was passed creating a committee to work with the Conservation Department and action was taken on a request from the Northern Rocky Mountain Section that the importance of the larch canker investigation be brought to the attention of the members of the Agricultural Committee of Congress. Dr. H. H. York was designated to prepare the letter.

Thirty-seven members attended an excellent informal dinner at Keeler's Restaurant.

J. Nelson Spaeth.
Secretary-Treasurer.

Washington Section Considers Idle Land

At the January 31 meeting of the Washington Section Raphael Zon gave a short and interesting talk on one of the major problems confronting the people of the Lake States, that of large areas of unproductive, non-tax-yielding land.

It appears that Michigan now has 7,000,000 acres and Minnesota 6,500,000 acres of idle forest land. These figures are being largely increased each year through the cutting and burning of timber-covered land and the abandonment of farm land, or rather land upon which farming has been more or less attempted. As an example somewhat typcial of the Lake States and of the Southeastern States, Mr. Zon drew attention to the recent survey conducted in New York which disclosed that 275,000 acres of farm land are being abandoned annually in that state. The full significance of allowing land to lie idle is not realized by all. Not only is the productive capacity and tax yield lost but there is an expense attached to permitting land to lie idle.

At the present rate of reforestation it will require about 1000 years to restore the idle land in the United States to good forest productivity. For the Mississippi River watershed there is need of 150,000,000 acres of fully stocked forest land to assist in flood control.

Mr. Zon holds that too many foresters have a narrow outlook as to the field of forestry. Too many cling to the simple theme of timber protection only. We should not lose faith in forestry. We should not be led astray by the talk of "substitutes for wood" and the illusive claims of chemists. Organic matter is the basis of everything, and wood and plenty of it will be indispensable at all times in the future.

Dr. Meinecke and Mr. Oxholm, in speaking of the part forest cover plays in flood control and in the moisture-retaining capacity of the soil, traced the various stages of the forest history of Spain. By repeated cutting, burning, and intensive grazing the once forested and rich producing plateaus in central Spain have been reduced to a hard baked and poor soil condition that does not permit of the production of sufficient grain for the local inhabitants. The Spanish Government is now undertaking to reforest and rebuild some of its unproductive land.

Ward Shepard in speaking of the fast disappearance of the virgin forests stated that 50 per cent of the lumber produced in the United States since 1800 has been produced since 1900. He advocates reforestation now and not the awaiting of the last figure or the final results of forest experiments.

Mr. Marshall advanced the theory, for which he does not claim originality, that by interesting people in the advantages to be obtained through recreation in the forests the energy that might otherwise seek an outlet in warfare might be used in beneficial ways. Here is an idea for extension work among our neighbors across the Rio Grande.

MORGAN PRYSE,
Secretary.

APPALACHIAN SECTION COMMITTEE DISCUSSES FORESTRY EDUCATION IN SECONDARY SCHOOLS[1]

The forest determines the country's welfare. It is therefore essential that the public have at least a general knowledge of it. A definite plan should be made and followed to attain this end. The school is the medium through which learning is systematically and methodi-

[1] Report presented at a meeting of the Appalachian Section, Raleigh, N. C., December 10, 1928.

cally pursued and attained. The secondary schools are a part of the nation-wide system of public schools, provided for the public's education.

Exclusive of the knowledge of trees, forests, or nature which the child should obtain in his primary grades, there should be a prepared course of forestry in the secondary grades. This means, of course, a liberal and not a technical presentation of the subject. Many whys and wherefores would naturally enough come into such a course, but the object should be to create a good general understanding and knowledge of the forest.

The student should have an acquaintance with trees, both in the seedling and in the maturer stages. He should know many of the articles made from wood, and at least a goodly number of the species usually considered the most valuable, and why. Such subjects as "The Wood-using Industry," "The Sawmill," "The Farm Woods," "Erosion," "The Forest Fire and its Attendant Evil," etc., should be covered by the teacher, with the forest talk as the leading idea in each case. The entomologist might bring the tree into his subject, showing it as a breeding place for insects, The botanist may see the tree and present it as a specimen of a certain species, genus, or family. The nature teacher may see the tree as a part of the nature scheme. The English teacher might even see the tree or forest as an excellent subject for a composition, or love story.

All this is well enough so far as it goes, but it is not the kind of "subject presentation" that holds the tree or forest as the *center of the picture* for the student. My idea is to make the child see the tree and the forest first, and then see the bug, the fire scar, the insect, erosion, undue winds, undue evaporation or high water, the sawmill, the wood-using industry, home furniture, fish, game and wild life, stream flow, etc., all as a part of the picture, with the tree and the forest as the center around which these are arranged.

The secondary school curriculum may be quite full already, but at the same time this subject is of enough importance to demand a place, and not as a mere afterthought or appendage. It should be the central idea; so long as it is merely *given the privilege* of being mentioned in other courses as a secondary or subsidiary idea to the subject, just so long it will be thus taught. A gentle but firm demand should be made for this course, not simply because it is called forestry, and therefore what people would generally term our "pet scheme," but because of its universal importance.

While it may be true that the majority of teachers know very little about trees and forests, and perhaps much less about teaching it, yet with properly prepared text books, with properly cited collateral reading, I believe the subject can be very effectively covered with even the present available teachers. It is not a question of technical forestry, but of liberal or general treatment of the subject, comparable to a general course in English or mathematics. No one expects every student who takes English or gymnasium to become an English teacher or an athlete.

The course which I am describing, and in which I believe, is for the purpose of giving what might be termed general culture, a better term perhaps than "general information." At any rate it is the part of one's general education which I see as the main object to attain

through this course in the secondary schools. The subject doubtless might be taught in connection with other studies, but should have its own text book. It might even be taught by the same teacher who gives geography or botany, but it should be known as forestry, and not as a side issue tacked on to some other as the body. In my judgment those in a position to *grant it a place* in the school can be shown that the subject is of prime importance, regardless of the fullness of the school curriculum.

This expresses my feelings as to what should be, something to strive for. Prior to its attainment it will be necessary no doubt to acecpt what can be secured.

R. S. MADDOX,
State Forester of Tennessee.

I have given some study and thought to the subject assigned our committee. I am, of course, convinced that one of the great problems of the profession is the creation of a forest-minded public. I believe that this problem is at the present time one of first importance, and more especially is this true in connection with the efforts of the several state departments of forestry. And one of the best avenues of approach is undoubtedly through the secondary schools.

The immediate problem therefore, is how best to make use of this approach. Should forestry be made the subject of a special course, or should forestry material find its place in other courses already in the curriculum? What should we teach, and how should it be presented? What should be avoided?

It is my opinion that forestry can best be taught by including various phases of the subject in the teaching of other subjects. Many new courses have already found their way into the curriculum, so that it is now usually found to be overloaded. Many more are constantly being urged. It is human nature for a member of any profession or the proponent of any particular idea to feel that his own educational project is of foremost importance. I have that feeling concerning forestry, and I often wonder that there can be any one so stupid as to fail to recognize the fact that this is *the* great problem of the times! But I think we need to remember that to education officials, confronted with and no doubt interested in many supplementary educational projects such as this, we may seem prejudiced and an attempt to crowd our course upon them may lose us their interest and cooperation.

Further, I think that our object will come nearer to being accomplished by being taught in other courses. If it is to be made a special course it can at best be included in only one grade. This means that the pupil crams his head full of it one year and probably forgets more of it the next than he would if the idea had reached him oftener in smaller doses. To use a rather worn-out simile: "Dripping water wears the rock more than a sudden splash."

Nature study and botany offer great opportunities for laying the foundations of an interest in forestry. The economic side of the subject can, if properly handled, be brought out in geography. It is possible that literature could be selected which would carry something of the forestry idea in readers or supplementary reading. Even in arithmetic, problems can be found which will give the opportunity to get the idea across.

I think care should be taken to appeal to students not entirely, or not primarily, along the line of nature and trees. This line of appeal has undoubtedly been overstressed in the past, and while it is of course necessary to begin here, we should end by getting across the economic importance of real forestry. A nature-lover who gets out of hand may become an enemy of true forestry.

I also think instruction in secondary schools should be kept free from the more scientific details. What we want to accomplish is a realization of the economic importance of forestry and a real interest in forestry which will result in future demands for adequate governmental forestry activities and in increased private practice of forestry.

These statements represent my present impressions, and are based to a small extent only on actual work with schools. We have as yet had but little means of pressing this important work, and in Virginia the surface has only been scratched. In fact, about all we have done has been in the way of talks to schools by chief forest wardens, backed up by a certain amount of volunteer work by interested teachers and an occasional illustrated lecture by one of the permanent staff. The syllabus requirements in some of the grade geography courses include a small amount of instruction in the species of trees found in the various forest regions of North America, but I rather doubt that much of this is getting across as it should.

S. G. Hobart,
District Forester,
Virginia State Forest Service.

The creation of forest-mindedness in our people is not only a matter of imparting a knowledge of what is practical forestry, but it is the instilling of a feeling of reverence for and sympathy with nature which must be begun in the home and carried all through the child's life. Education and training should, therefore, aim to bring about a full appreciation of both the æsthetic and economic values of the forest. The former must begin with infancy; the latter can, with the appreciation of these æsthetic values as a foundation, be taken up with advantage at an age when practical considerations begin to receive serious attention.

The introduction of a one year course in forestry in the secondary schools, as proposed by Mr. Maddox, would undoubtedly be, as he contends, of great practical as well as cultural value, but the great difficulty of having such a course introduced and carried through the public schools, even though a law requiring it be placed upon the statute books, makes it something to be gradually worked towards rather than a practical present day problem.

In most states the most practical way of reaching the children with information and inspiration is, as suggested in "The Forest, A Hand-book for Teachers," by Mrs. D. P. Edgerton of the U. S. Forest Service, to relate instruction to the courses which are already being carried on in the schools. The successful operation of these correlated courses as well as the establishment and operation of the one year course in forestry depends to a very large extent on the information and the desires of the teachers in the schools. Without their real interest little can be accomplished. Certainly much more can be put across to the children through an interested teacher than through one who is not in-

terested, even though a set course is prescribed.

The chief effort, therefore, should be to secure the interest of the teachers and then to give them enough information to enable them to interest their pupils. This in North Carolina is the main objective. With the approval of the State Department of Education one or more illustrated lectures on the various phases of forestry are given by the State Forest Service at the various summer schools of instruction which teachers in the public schools are required to attend. While this instruction is little more than a glimpse of the subject it has been sufficient to interest a large number of teachers all over the state.

This interest has been manifested in the demand which has come from teachers for material which they can use in giving some forestry instruction in their classes in general science, biology, botany, geography, civics, and other subjects. The U. S. Forest Service publication above referred to has been purchased by the State Forest Service and distributed free to teachers who ask for such help. Ten thousand copies of the handbook, Common Forest Trees of North Carolina, have been sold to the schools at the nominal price of 50 cents per dozen. These have been used by the pupils under the direction of the teachers who applied for them. Through the generosity of Mr. Charles Lathrop Pack, many thousands of copies of the Forestry Primer have been furnished free to schools in North Carolina both direct from Washington and through the State Forest Service. In one week recently the American Tree Association of which Mr. Pack is president sent into North Carolina 5400 copies to 74 separate schools. The demand for material for school observance of Arbor Day and American Forest Week has been steadily increasing. These and other school activities, such as the writing of compositions and prize essays, are all the results of a growing interest in forestry on the part of the teachers.

Another way of interesting the teachers and pupils in the schools has recently been inaugurated in North Carolina. The state forest nursery is offering a minimum of 100 and a maximum of 500 seedlings of a suitable species of pine free of charge to any high school in the state which will agree to plant them on land adjacent to the school and owned or controlled by it, and maintain the plantation as a school forest. Some 27 small school forests were established in this way last year. The success of this feature depends entirely on the interest of the principals and teachers of the schools.

In summing up for this committee I would, therefore, say that the interest of the teachers must be secured first of all and this can be done quite as well by emphasizing the æsthetic values as by dwelling on the economic importance of forests. Both sides of the problem, however, should be brought before the teachers on every possible occasion. Secondly, every effort should be made to interest even the smallest child in the life and beauty of the trees and forests. Thirdly, the economic values should be stressed after the children are in high school and after their interest in the æsthetic and vital values have been aroused. This third part of the program can be carried out either by a course as suggested by Mr. Maddox or by relating it to already existing courses as advocated by Mr. Hobart and arranged by Mrs. Edgerton, or in both such ways. The

main point to be remembered is that the interest of the teacher must be aroused and her mind informed before any effective approach can be made to the pupil.

J. S. Holmes,
State Forester of North Carolina.

Northern Rocky Mountain Section Combines Business and Technical Papers

The Northern Rocky Mountain Section met in Missoula on February 18 with 45 present, including Superintendent Coe of the Flathead Indian Reservation, three members of the Indian Forest Service, and Frank Rose in charge of the Bison Range at Moiese.

Replies from the New York and New England Sections to the communications concerning the larch canker were reported by Committee Chairman W. W. White. The New York Section has written to certain members of Congress but the New England Section reports no action so far.

The committee appointed at a previous meeting to investigate the fitness of the questions used in the examination for Junior Forester made a comprehensive report through its chairman, H. R. Flint, the gist of which was that the questions are fair and reasonable and well adapted to test the fitness of competitors for work in the Service.

Chairman Cook of the Legislative Committee reported action taken to forestall a favorable report by the committee of the legislature having in charge a bill to modify the Montana forestry law by excepting settlers who are clearing lands from responsibility for their fires and from the requirement of securing permits to burn. The bill was killed in the committee by unanimous vote.

Papers by I. T. Haig and R. E. Fields were read dealing with the regeneration of cut-over lands in the white pine type. Mr. Haig recounted the work of the Northern Rocky Mountain Forest Experiment Station in studying cut-over areas to determine the effects of the various methods of cutting on reproduction. He gave figures for three typical areas, one a strip cutting, one a crude shelterwood system, and one a clear cutting with seed trees left and fir and hemlock girdled, dividing them by aspect into north, south and west exposures. These figures show good restocking in all cases, except south exposures in the clear-cutting area, where both the number of seedlings and the percentage and distribution of white pine leave room for improvement. In general it was found that all three systems resulted in satisfactory regeneration of the stand.

Emphasizing the preliminary nature of the findings resulting from only partial compliation of the data secured, Mr. Haig summarized them as follows:

(1) Clear-cutting of southerly aspects is undesirable.

(2) Girdling of white fir and hemlock tends to create light conditions favorable to white pine, except on drier aspects, but does not prevent seeding of the girdled species.

(3) On some cut-over areas a large percentage of the reproduction comes from seed trees rather than from seed in the duff.

Among the conclusions Mr. Fields arrived at from a study of Callahan Creek area are:

(1) Seed trees play an important rôle in regeneration, although seed in the duff

contributes at least 40 per cent of the stocking which occurs within three to five years following cutting.

(2) White pine seed will germinate even under 75 per cent crown density but will not survive here.

(3) Survival increases as crown density decreases to an average of from 15 to 25 per cent northern exposures and 30 to 40 per cent for southern exposures.

(4) Humus is a vital factor influencing regeneration. Duff of medium thickness favors white pine over other species.

(5) Severe burns are detrimental to the restocking of all species.

(6) Cedar should be recognized as of almost equal importance to white pine and stands should be treated accordingly.

Southeastern Section Holds Annual Meeting

Visitors and members to the number of twenty-six met at the Lumbermen's Club at Jacksonville, Florida, on March 1 for the annual meeting of the Southeastern Section, held at the time of the American Forestry Association Convention. Besides the election of officers, territorial limits of the Section in the by-laws were made to include Florida, the coastal region of South Carolina, and the coastal plain and piedmont regions of Georgia and Alabama. Colonel Henry S. Graves gave an interesting report on the study of forestry education which is being undertaken by the Society and which has been discussed elsewhere in recent numbers of the Journal. A resolution was adopted recommending action to enlarge the avenues of publication for governmental research.

Officers for the coming year include I. F. Eldredge, Fargo, Georgia, as Chairman; Harry Lee Baker, of Tallahassee, Florida, Vice-chairman; and W. F. Oettmeier, Fargo, Georgia, as Secretary and Treasurer. Action was taken on a number of membership applications.

S. J. Hall,
Acting Secretary.

Announcement of Candidates for Membership

The following names of candidates for membership are referred to Junior Members, Senior Members, and Fellows for comment or protest. The list includes all nominations received since the publication of the list in the November Journal, without question as to eligibility; the names have not been passed upon by the Executive Council. Important information regarding the qualifications of any candidate, which will enable the Council to take final action with a knowledge of essential facts, should be submitted to the undersigned before May 1, 1929. Statements on different men should be submitted on different sheets. Communications relating to candidates are considered by the Council as strictly confidential.

FOR ELECTION TO GRADE OF JUNIOR MEMBER

Name and Education	*Title and Address*	*Proposed by*
Baker, Wm. J. Oregon State, B. S.	Efficiency man, Pacific Spruce Corporation, Toledo, Ore.	North Pacific Sec.
Beals, Wilfred F. Univ. of Idaho, B. S. F., 1927	Forest Ranger in Charge, Elk Mountain District, Harney N. F. Custer, S. D.	Central Rocky Mt. Sec.

Name and Education	*Title and Address*	*Proposed by*
Brady, Norris D. Penn. State, B. S. F., 1928	Ass't Division Forester, Scranton, Pa.	Allegheny Sec.
Burns, Kendrick Bowdoin College, A. B., 1914	Manager, Woodlands Dept., S. D. Warren Co., Bingham, Me.	New England Sec.
Chapman, Roy A. Univ. of Minn., B. S. F.	Forest Ranger, Chippewa National Forest, New Orleans, La.	New England and Central Rocky Mountain Sec.
Clement, Raymond Univ. of Minn., B. S. F., 1927	Assistant in Fire Weather Investigations, Minn. Forest Service, Minneapolis, Minn.	Minnesota Sec.
Cochran, Allan R. Idaho School, B. S. F., 1928	Timber Sales Assistant, Crater National Forest, Ore.	North Pacific Sec.
Commins, Maurice J. Univ. of Toronto, B. S. C. F., 1922; Yale, M. F., 1925	Assistant Manager, James D. Lacey & Co., Ltd., Canada.	J. W. Toumey R. C. Bryant H. H. Chapman
Connell, Alison B. Univ. of Toronto, B. S. C. F., 1914; Yale, M. F., 1922	District Forester, Ontario Forest Service, Canada.	R. C. Bryant J. W. Toumey H. H. Chapman
Cummings, Laurence J. Oregon State, B. S. logging engineering, 1928	Instructor in logging engineering Oregon State College, Corvallis, Ore.	North Pacific Sec.
Daley, Raymond K. Conn. Agric. College, B. S. F., 1928	Junior Scientific Aid and Field Assistant, Northeastern For. Exp. Sta., Amherst, Mass.	New England Sec.
Dalke, Paul D. Univ. of Mich., B. S. F., 1925; M. S. F., 1928	Junior Instructor, School of Forestry & Conservation, Univ. of Michigan, Ann Arbor, Mich.	Ohio Valley Sec.
Dean, George Wilson Penn. State, B. S. F., 1926; Yale, M. F., 1927	District Forester, Virginia State Forest Service, Richmond, Va.	Appalachian Sec.
Erickson, Eugene T. Univ. of Minn., B. S. F., 1926	Forester, Armstrong Tree Service, Ltd., Poughkeepsie, N. Y.	New York Sec.
Faull, Joseph Horace Univ. of Toronto, B. A., 1898; Harvard Univ., Ph. D., 1904; Forestry School, Munich Univ.	Professor of Forest Pathology, Harvard University, Jamaica Plain, Mass.	New England Sec.
Goldberg, Hyman Univ. of Minn., B. S. F., 1926	Student, Yale Forestry School, New Haven, Conn.	Minnesota Sec.
Grimes, Francis L. N. Y. St. Ranger School, 1924	Senior Forest Ranger, Dahlonega, Ga.	Appalachian Sec.
Hill, Ralph Ripley Conn. Agric. College, B. S., 1925; Yale, M. F., 1927	Ranger, U. S. Forest Service, Harney National Forest, Keystone District, Keystone, S. D.	Central Rocky Mt. Sec.
Hills, F. Gilbert Univ. of Maine, B. S. F., 1924	Draftsman, Mass. Dept. of Conservation, Boston, Mass.	New England Sec.
Horton, Gerald S. Univ. of Minn., B. S. F., 1927; Yale, M. F., 1928	Ass't District Ranger, Harney National Forest, Custer, S. D.	Central Rocky Mt. Sec.
Howarth, James A., Jr. Yale, LL. B., 1896; M. F., 1906	Lumberman, Indian Service, Spokane, Wash.	J. P. Kinney Wm. H. von Bayer E. Morgan Pryse

Name and Education	*Title and Address*	*Proposed by*
Ingall, Oswald D. Cornell, B. A., 1907; Yale, M. F., 1909	Island Service Company, Nantucket, Mass.	New England Sec.
Isola, Vico C. Tufts, B. S., 1913; Yale, M. F., 1914	Exec. Secy. Maine Hardwood Asso., Publicity Director, Maine Forest Service, Exec. Secy. Maine Development Commission, Augusta, Me.	New England Sec.
Jones, Theodore R. Penn. State, B. S. F.	Timber cruiser, J. D. Lacey & Co., Plymouth, Pa.	Allegheny Sec.
Keur, Johan Yak Yale, M. F., 1925	Postgraduate student, Columbia University, and assistant at Museum, Riverdale-on-Hudson, N. Y.	New York Sec.
Koomey, Levon H. Amherst College, B. A., 1909; Yale, M. F., 1912	Owner and manager, private forestry and landscape business, Worcester, Mass.	New England Sec.
Limstrom, Gustaf Univ. of Minn., B. S. F., 1928	Assistant Ranger, Medicine Bow, N. F., Albany, Wyo.	Minnesota Sec.
Locke, John P. High School, 1901; Civil Engineering, Correspondence School	Forest Manager, N. H. and Vermont Lumber Co., West Stewartson, N. H.	New England Sec.
Lund, Walter H. Oregon State, B. S. F., 1927	Forest Ranger, U. S. F. S., Port Angeles, Wash.	North Pacific Sec.
McGraw, Edward B. Univ. of Mich., B. Sc. F., 1924	Forest Engineer, Ontario Paper Co., Shelter Bay, North Shore, P. Q., Can.	B. E. Leete S. T. Dana Robert Craig, Jr. E. V. Jotter
MacDonald, James C. Univ. of Maine, B. S. F., 1928	Park guard, Newton, N. J.	Allegheny Sec.
Martin, Glen C. High School	Superintendent, State Forest Nursery, Marietta, Ohio.	Ohio Valley Sec.
Melcher, Edmund C. 2 years, Univ. of Maine, Col. of Agriculture, 1917	Assistant, S. D. Warren Co., Bingham, Me.	New England Sec.
Moore, Robert Penn. State, B. S. F., 1922	Extension Forester, Baton Rouge, La.	Gulf States Sec.
Morey, Cedric F. High School.	Supervisor, Alpena State Forest, Alpena, Mich.	Ohio Valley Sec.
Nelson, Alfred L. N. Y. State, B. S. F.	Public Relations Assistant, Minn. State Forest Service, St. Paul, Minn.	Minnesota Sec.
Orr, Leslie W. Univ. of Minn., B. S. F., 1927	Assistant in Entomology, Univ. of Minnesota, St. Paul, Minn.	Minnesota Sec.
Phipps, Carl L. Univ. of Maine, B. S. F., 1925	Forestry Division, Brown Co., Berlin, N. H.	New England Sec.
Pike, Galen W. Univ. of Idaho, B. S. F., 1927; Yale, M. F., 1928	Forest Ranger, Chippewa National Forest, Cass Lake, Minn.	Central Rocky Mt. Sec.
Righter, F. L. Cornell, B. S., 1923; M. F., 1928	Junior Forester, Forest Service, New Orleans, La.	Gulf States Sec.

Name and Education	*Title and Address*	*Proposed by*
Ritt, William G N. Y. State College, B. S. L., 1925	Sales Engineer, Curtin-Howe Corp., Philadelphia, Pa.	Allegheny Sec.
Rudolph, Paul Univ. of Minn., B. S. F., 1928; Cornell Univ., M. F., 1929	Graduate Assistant, Forestry Dept., Cornell Univ., Ithaca, N. Y.	New York Sec.
Schriener, Fred J. Oregon State, B. S. Logging Engineering	Instructor, School of Forestry, Corvallis, Ore.	North Pacific Sec.
Shaner, W. A. J. Penn. State, B. S. F., 1926	Hammermill Paper Co., Erie, Pa.	Allegheny Sec.
Smith, Elton Jay Conn. Agric. College, B. S., 1923; Yale, M. F., 1925	Forest Ranger, U. S. F. S., Hot Springs, Ark.	Gulf States Sec.
Soderston, Herbert R. Yale, Ph. B., 1920; Yale Forest School, 1921, one year	Chief Logging Engineer, Abitibi Power & Paper Co., Ltd., Iroquois Falls, Ontario, Canada.	B. F. Avery H. H. Chapman R. C. Bryant J. W. Toumey
Tappenden, Richard P. Ohio State, B. S. F., 1917; Yale, M. F., 1918	Cleveland Representative, A. N. Milne Lbr. Co., Inc., of N. Y., Cleveland, Ohio.	R. C. Bryant J. W. Toumey R. C. Hawley H. H. Chapman B. E. Leete
Turner, George W. C. Univ. of Maine, B. S. F., 1927	District Forester, Conn. Forestry Dept., Haddam, Conn.	New England Sec.
Van Alstine, J. Neil Univ. of Minn., B. S. F., 1928	Forest Patrolman, Minn. Forest Service, Wilton, Minn.	Minnesota Sec.
Weaver, Harold Oregon State, B. S. F., 1928	Forest Asst., U. S. Indian Service, Klamath Agency, Ore.	North Pacific Sec.
Wilson, Thomas A. 1 year's credit, Kingfisher College.	Forest Ranger, Catawba Ranger Dis., Pisgah Nat. For., Marion, N. C.	Appalachian Sec.
Wing, Gerald E. Univ. of Maine, B. S. F., 1926; Yale, M. F., 1928	Forester, Great Northern Paper & Pulp Co., Bangor, Me.	New England Sec.
Wood, Arthur A. High School	Supervisor, Nantahala N. F., Asheville, N. C.	Appalachian Sec.

FOR ELECTION TO GRADE OF SENIOR MEMBER

Anderson, S. Duval Univ. of Mich., B. S. F., 1919 (Junior Member 1923)	Forest Supervisor, Delta, Colo.	Central Rocky Mt. Sec.
Barker, William L. Purdue Univ., B. S. Sc., 1908 (Junior Member 1921)	Forest Officer in Charge, Michigan Purchase Units, Munising, Mich.	Minnesota Sec.
Buttrick, Philip L. Yale, M. F., 1911 (Junior Member 1921)	Secretary and Forester, Conn. Forestry Association, New Haven, Conn.	New England Sec.
Coville, Perkins Cornell Univ., B. S. F., 1918; M. F., 1921 (Junior Member 1924)	Associate Silviculturist, Forest Service.	Washington Sec.

Name and Education	*Title and Address*	*Proposed by*
DeCamp John C. Mich. Agric. College, B. S. F., 1910; Mich. State, M. F., 1923 (Junior Member 1926)	Asst. Prof., Forestry, Mich. State College, East Lansing, Mich.	Ohio Valley Sec.
DeFlon, Leland L. Univ. of Minn., B. S., 1918; M. S., 1922 (Junior Member 1925)	Asst. Wood Technologist, Forest Prod. Lab., Madison, Wis.	Wisconsin Sec.
Donery, Joseph A. Common school; one year in business college (Junior Member 1923)	Logging Engineer, District Office, Denver, Colo.	Central Rocky Mt. Sec.
Friend, Francis H. Univ. of Maine, B. S., 1920; Yale, M. F., 1922 (Junior Member 1923)	Proprietor, Central Maine Forest Nursery, Skowhegan, Me.	New England Sec.
Goodwin, James L. Yale, B. A., 1905; M. F., 1910 (Junior Member 1921)	Secretary & Treasurer, Talcott Mt. Forest Protective Asso., Hartford, Conn.	New England Sec.
Hopkins, Howard Yale, B. A., 1921; M. F., 1923 (Junior Member 1924)	Forest Supervisor, Chippewa N. F., Cass Lake, Minn.	Minnesota Sec.
Janouch, Karl L. Univ. of Nebr., B. S., 1917 (Junior Member 1923)	Technical Ass't, White River N. F., Glenwood Springs, Colo.	Central Rocky Mt. Sec.
Johnson, Eric A. N. Y. St. College, B. S. F., 1920 (Junior Member 1923)	Technical Ass't, Cochetopa N. F., Salida, Colo.	Central Rocky Mt. Sec.
Kellogg, Leonard F. Yale, M. F., 1927 (Junior Member 1925)	Ass't Silviculturist, Central States For. Exp. Station, Columbus, Ohio.	Ohio Valley Sec.
Leffelman, L. J. Univ. of Minn., B. S. F., 1923; Yale, M. F., 1925 (Junior Member 1926)	Ass't Forester, Dept. of Forestry, Ohio Agric. Exp. Sta., Wooster, Ohio.	Ohio Valley Sec.
MacAloney, Harvey J. N. Y. State, B. S., 1923; M. F., 1925 (Junior Member 1926)	Graduate Ass't, Dept. of Forest Entomology, N. Y. St. Col. of For., Syracuse, N. Y.	New England Sec.
Petheram, H. D. 3 years Forestry at Iowa State (Junior Member 1923)	Ass't Supervisor, Pike N. F., Colo. Springs, Colo.	Central Rocky Mt. Sec.
Pillow, Maxon Y. Graduate, Univ. of Minn. Forestry. Graduate work, Univ. of Wisc. (Junior Member 1925)	Jr. Wood Technologist, Forest Pro. Lab., Madison, Wis.	Wisconsin Sec.
Schrader, Walter H. Two years agriculture Colo. Agric. College (Junior Member 1921)	Sr. Forest Planting Ass't, Forest Service, Monument, Colo.	Central Rocky Mt. Sec.

Name and Education	*Title and Address*	*Proposed by*
Sheals, Ralph A. N. Y. St. College, B. S., 1917 (Junior Member 1923)	Agent, Transit Inspection, Providence, R. I.	New England Sec.
Silva, Abbott Yale, Ph. B., 1908; Yale, M. F., 1909 (Junior Member 1922)	President, Silva-Pfeiffer Co., Cleveland, Ohio.	S. T. Dana Robert Craig, Jr. E. V. Jotter
Stickel, Paul W. N. Y. State, B. S., 1923; Yale, M. F., 1924 (Junior Member 1924)	Ass't Silviculturist, Forest Service, Amherst, Mass.	New England Sec.
Stott, Calvin Penn. State, B. F., 1922; Yale, M. F., 1925	Senior Forest Ranger, Chippewa N. F., Deer River, Minn.	Minnesota Sec.
Webb, Martin R. Univ. of M., B. S. F., 1919 (Junior Member 1927)	Forester, Game Div., Mich. Dept. Conservation, Lansing, Mich.	Ohio Valley Sec.
Weber, Wallace W. Univ. of Mich., B. S., 1912; M. S. F., 1914 (Junior Member 1925)	Forest Products Lab., Madison, Wis.	Wisconsin Sec.
Wells, Sidney Deeds Mass. Institute of Technology, B. S. Chemical Engineering (Junior Member 1921)	Director, Paper Mill Labs., Inc., Quincy, Illinois.	Robert Craig, Jr. E. V. Jotter Shirley W. Allen
Westveld, R. H. Mich. State, B. S., 1922; Yale, M. F., 1925 (Junior Member 1924)	Ass't Prof. of Forestry, Michigan State College, East Lansing, Mich.	Ohio Valley Sec.

FOR ELECTION TO GRADE OF ASSOCIATE MEMBER

Kienholz, Raymond Northwestern College, B. S., 1917; Univ. of Ill., M. S., 1920; Univ. of Ill., Ph. D., 1922	Instructor, Botany Dept., U. of Ill., Urbana, Ill.	Ohio Valley Sec.
Luther, Thomas C. Grade school only	Mechanicville, N. Y.	New York Sec.
Stace, Arthur W. Notre Dame, A. B., 1896	Director, Mich. Public Utility Information Bureau, Ann Arbor, Mich.	Ohio Valley Sec.
Tilghman, H. L. College Graduate	President and General Manager, Tilghman Lbr. Corpn., Marion, S. C.	Appalachian Sec.

B. A. CHANDLER,
Member of Executive Council in Charge of Admissions.

SOCIETY OFFICERS

Officers and Members of Executive Council

President, PAUL G. REDINGTON, Biological Survey, Washington, D. C.
Vice-President, J. F. PRESTON, Hammermill Paper Co., Erie, Pa.
Secretary, R. E. MARSH, Forest Service, Washington, D. C.
Treasurer, W. N. SPARHAWK, Forest Service, Washington, D. C.

Executive Council

The Executive Council consists of the above officers and the following members:

	Term expires		Term expires
R. Y. STUART	Dec. 31, 1932	J. S. HOLMES	Dec. 31, 1933
ALDO LEOPOLD	Dec. 31, 1931	W. G. HOWARD	Dec. 31, 1933
T. T. MUNGER	Dec. 31, 1930	OVID M. BUTLER	Dec. 31, 1929

Member in Charge of Admissions

B. A. CHANDLER.....Dec. 31, 1929

Section Officers

Allegheny

W. M. Baker, Chairman, Department of Conservation and Development, Trenton, N. J.
T. W. Skuce, Vice-Chairman, University of West Virginia, Morgantown, W. Va.
H. F. Round, Secretary, Forester's Office, Pa. R. R. Co., Philadelphia, Pa.

Appalachian

M. A. Mattoon, Chairman, U. S. Forest Service, Asheville, N. C.
E. H. Frothingham, Vice-Chairman, Appalachian Forest Experiment Station, Asheville, N. C.
John W. McNair, Secretary, U. S. Forest Service, Asheville, North Carolina.

California

C. Stowell Smith, Chairman, 600 Call Building, San Francisco, Calif.
F. S. Baker, Secretary, 305 Hilgard Hall, Berkeley, Calif.

Central Rocky Mountain

Fred R. Johnson, Chairman, Forest Service, Denver, Colo.
Allen S. Peck, Vice-Chairman, Forest Service, Denver, Colo.
H. D. Cochran, Secretary, Forest Service, Denver, Colo.

Gulf States

E. L. Demmon, Chairman, 326 Custom House, New Orleans, La.
N. D. Canterbury, Secretary, New Court House, New Orleans, La.

Intermountain

C. N. Woods, Chairman, Forest Service, Ogden, Utah.
R. J. Becraft, Vice-Chairman, Utah Agricultural College, Logan, Utah.
E. W. Nelson, Secretary, Forest Service, Odgen, Utah.

Minnesota

J. H. Allison, Chairman, University Farm, St. Paul, Minn.
L. W. Rees, Secretary, University Farm, St. Paul, Minn.

New England

E. C. Hirst, Chairman, 11 Tahanto St., Concord, N. H.
A. C. Cline, Secretary, Harvard Forest, Petersham, Mass.

New York

Samuel N. Spring, Chairman, Cornell University, Ithaca, N. Y.
J. Nelson Spaeth, Secretary, Cornell University, Ithaca, N. Y.

Northern Rocky Mountain

C. D. Simpson, Chairman, U. S. Forest Service, Missoula, Mont.
M. I. Bradner, Secretary, U. S. Forest Service, Missoula, Mont.

North Pacific

Geo. W. Peavy, Chairman, Oregon State Agricultural College, Corvallis, Ore.
William F. Ramsdell, Member of Executive Committee, Box 4137, Portland, Ore.
E. J. Hanzlik, Secretary, Box 4137, Portland, Ore.

Ohio Valley

C. J. Telford, Chairman, 504 N. Romine St., Urbana, Ill.
R. B. Miller, Secretary, Department of Conservation, Springfield, Ill.
B. E. Leete, Chairman of Membership Committee, Room 51, First National Bank Bldg., Portsmouth, Ohio.

Southeastern

Capt. I. F. Eldredge, Chairman, Fargo, Ga.
Harry Lee Baker, Vice-Chairman, Tallahassee, Fla.
W. M. Oettmeier, Fargo, Ga.

Southwestern

Hugh G. Calkins, Vice-Chairman, U. S. Forest Service, Albuquerque, N. M.
Quincy Randles, Secretary, Forest Service, Albuquerque, New Mexico.

Washington

George P. Ahern, Chairman, Woodley Apartments, Washington, D. C.
E. Morgan Pryse, Secretary, Office of Indian Affairs, Washington, D. C.
R. E. Marsh, Member of Executive Committee, Forest Service, Washington, D. C.

Wisconsin

R. D. Garver, Chairman, Forest Products Laboratory, Madison, Wis.
John B. Cuno, Secretary, Forest Products Laboratory, Madison, Wis.